

# **Estuary Subcommittee Update**

## **Aug. 2011**

# Sound Ecological Environment



Table 2-1: Summary of mean annual flow of the Nueces River into the Nueces Estuary (1940 to 1996)<sup>1</sup> and upper Nueces Delta (1940 to 1999)<sup>2</sup>. Time periods in both studies were based upon the construction dates of large reservoirs in the watershed.

Time Period	Mean annual river flow into Nueces Estuary (acre-ft)	Percent change from Period I	Mean annual river flow into upper Nueces Delta (acre-ft)	Percent change from Period I
1940-1957	619,000	—	127,997	—
1958-1982	614,000	-0.8%	77,989	-39.1%
1983-1996(9)	279,000	-54.9%	537	-99.6%

<sup>1</sup> Source: Asquith *et al.* 1997.

<sup>2</sup> Source: Irlbeck and Ward 2000.

Note: 1 acre-ft =  $1.2336 \cdot 10^3 \text{ m}^3$

- 1958 – Lake Corpus Christi → 1 Overbanking per year
- 1982 – Lake Choke Canyon → 1 Overbanking every 3 years
- Major modifications and channelization of river preventing OB
- Historical delivered during spring and fall “flashy” events
- Current Agreed Order is 138,000 ac-ft yr<sup>-1</sup>

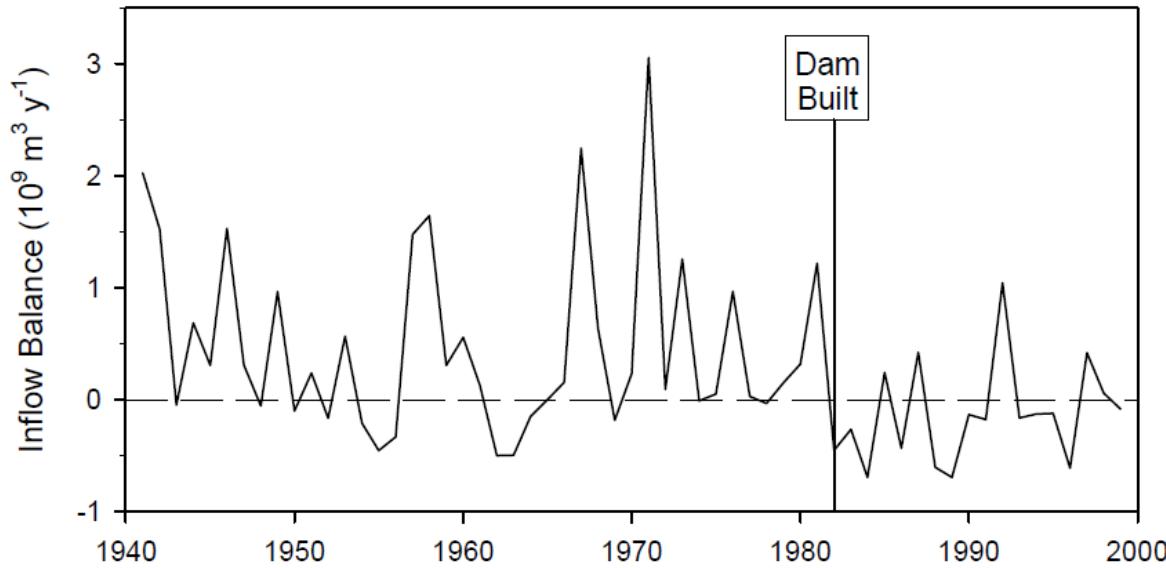


Figure 2: Average annual net inflow balance into Nueces Bay [10].

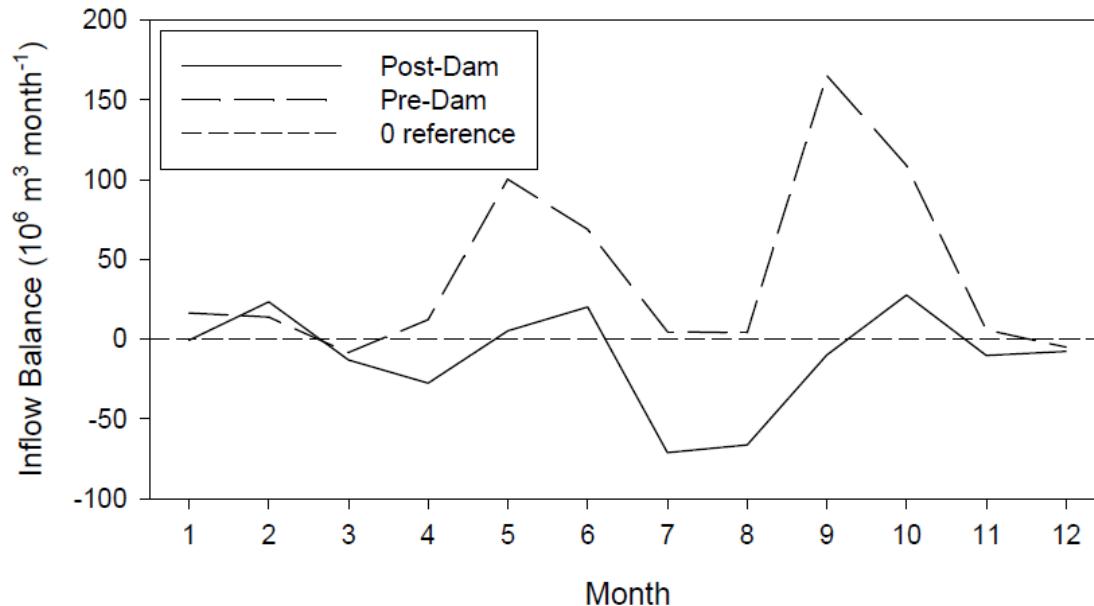
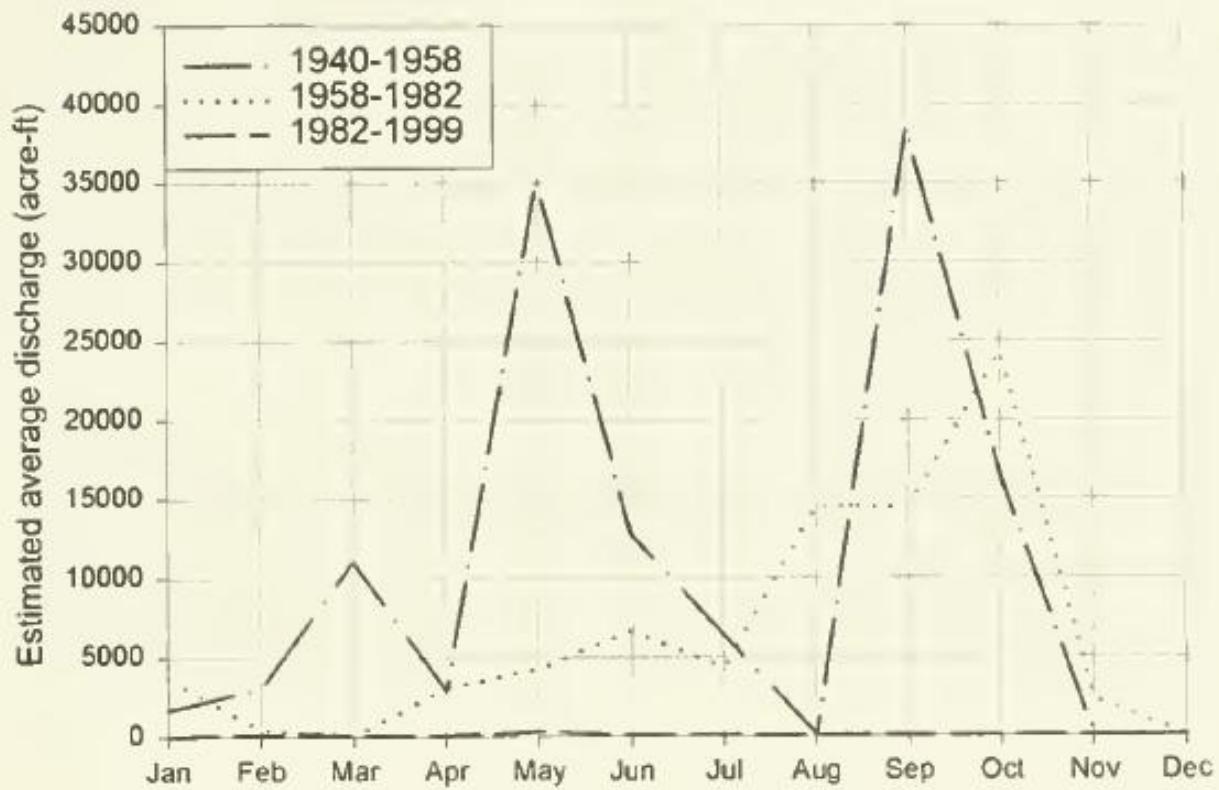
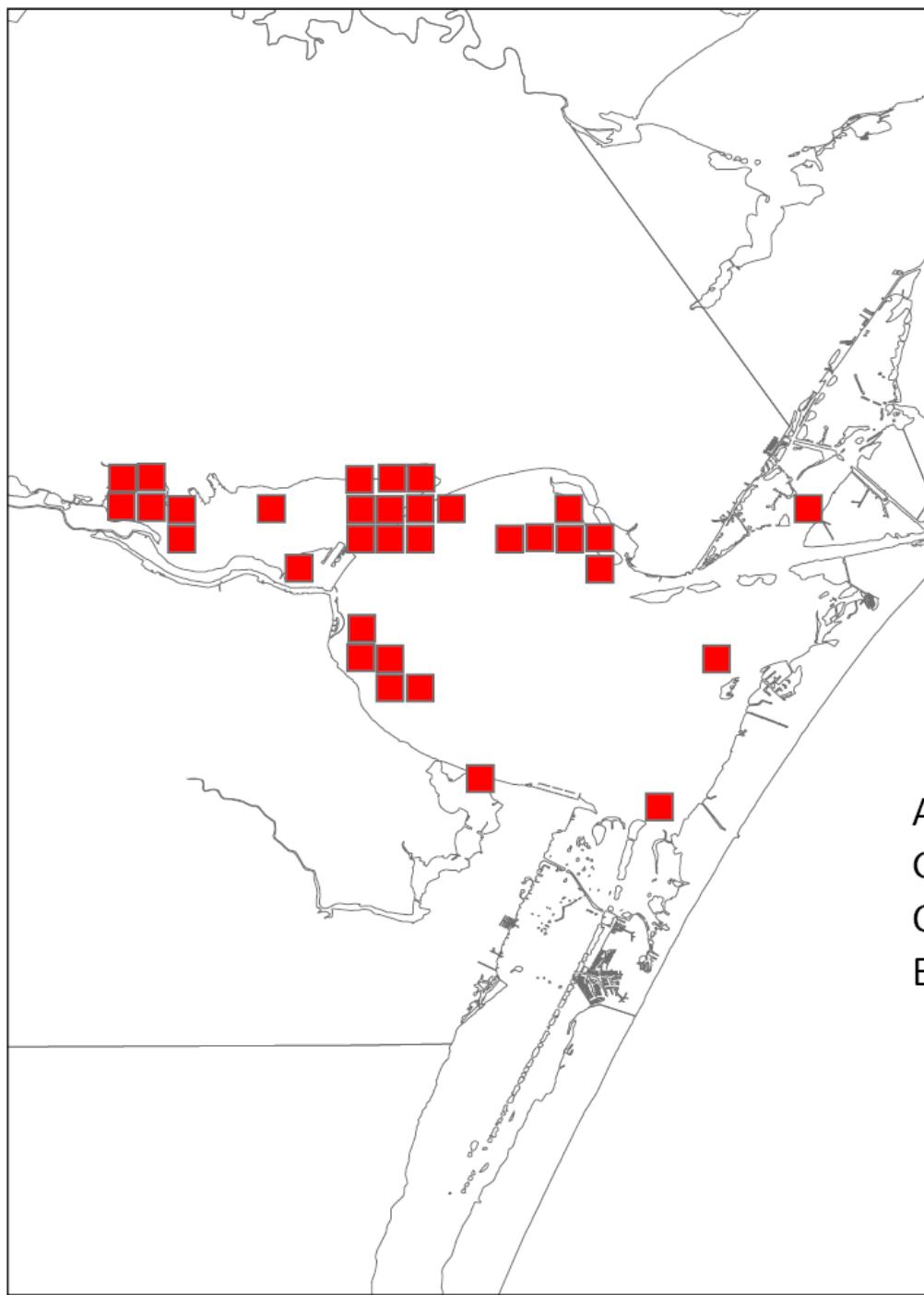


Figure 3: Average monthly inflow balance into Nueces Bay [13].



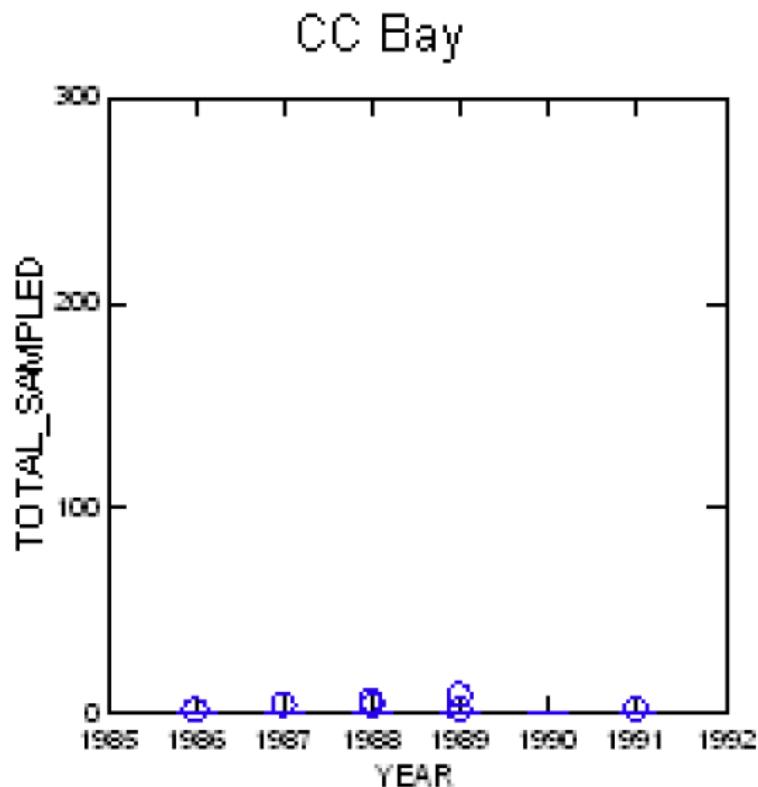
**Figure 11: Historic magnitude of flow events into the upper Nueces Delta. Not included were data from the largest event in each time period.**

Note: 1 acre-ft =  $1.2335 \cdot 10^3 \text{ m}^3$ .

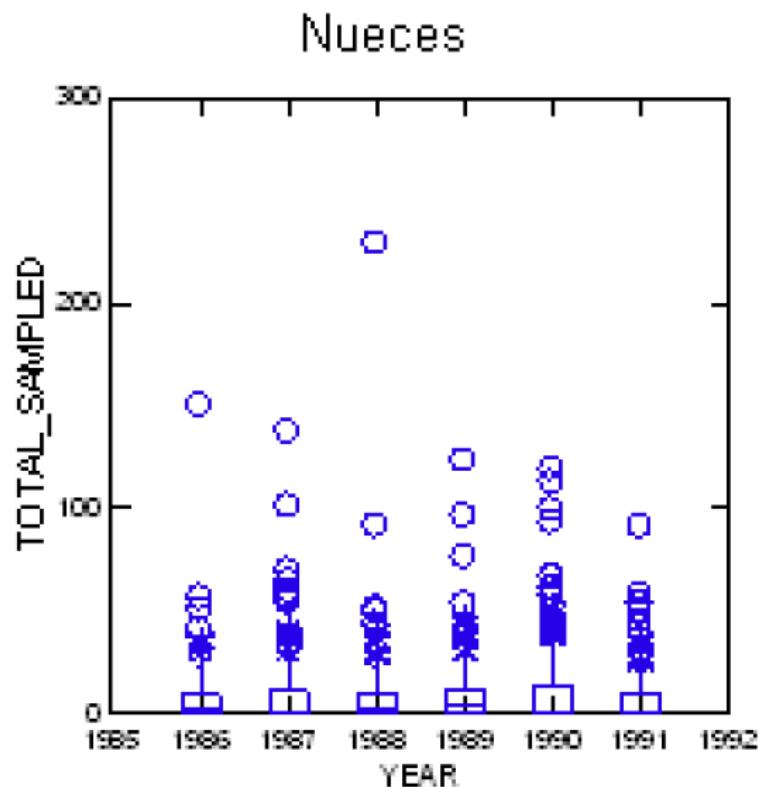


Active Sampling  
Grids in the Corpus  
Christi – Nueces  
Bay Estuary

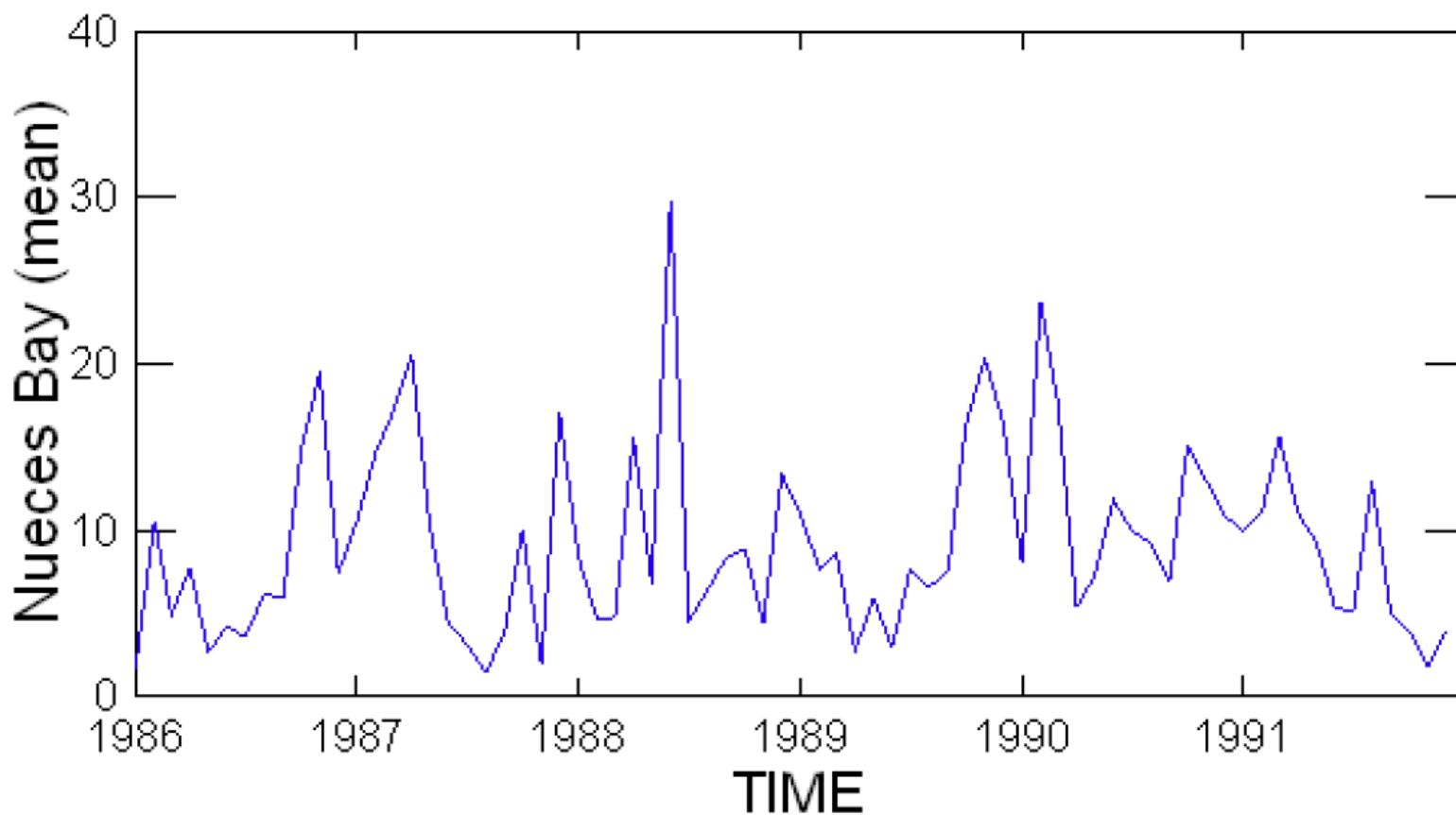
N = 965  
Mean = 0.027  
SD = 0.352

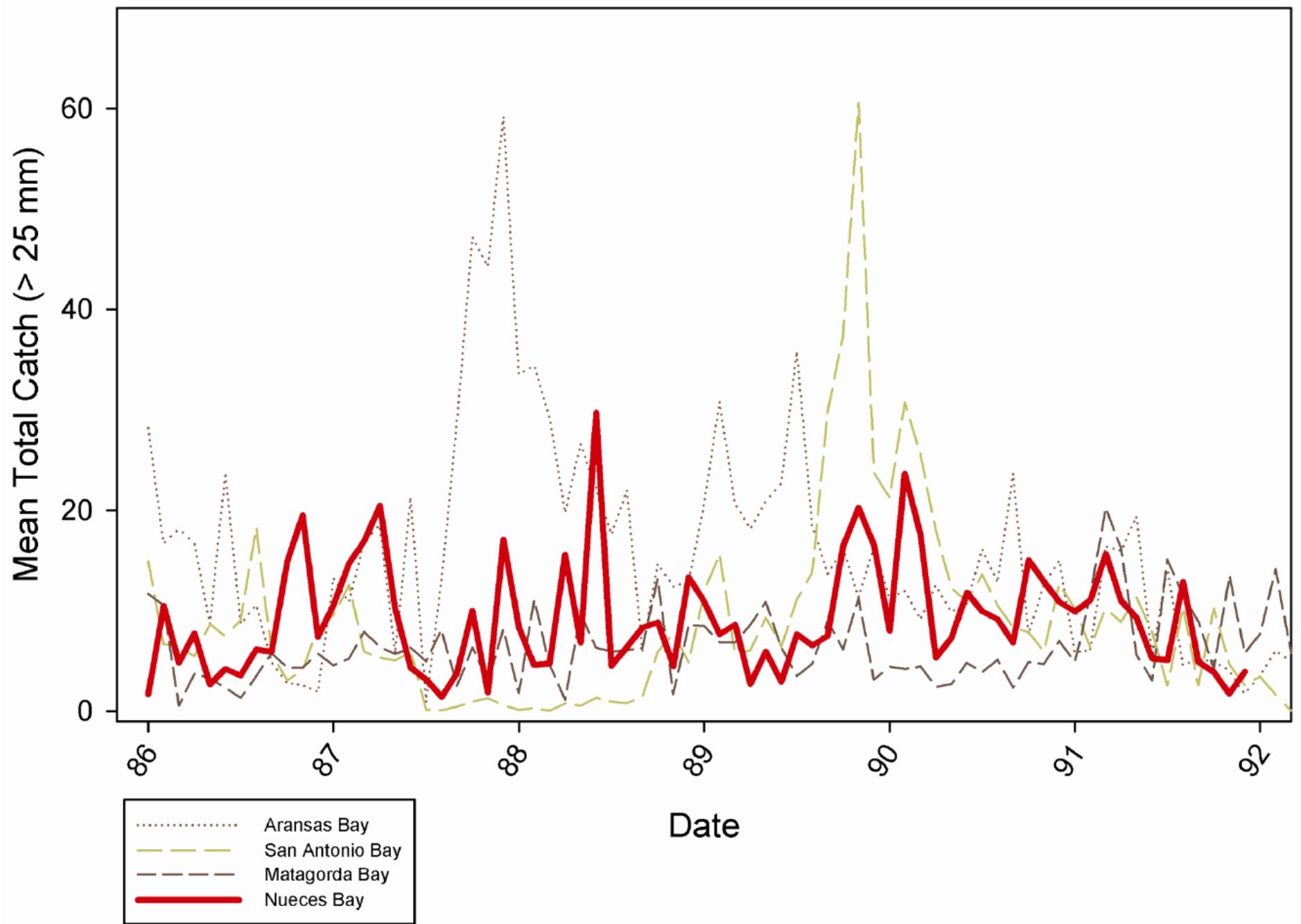


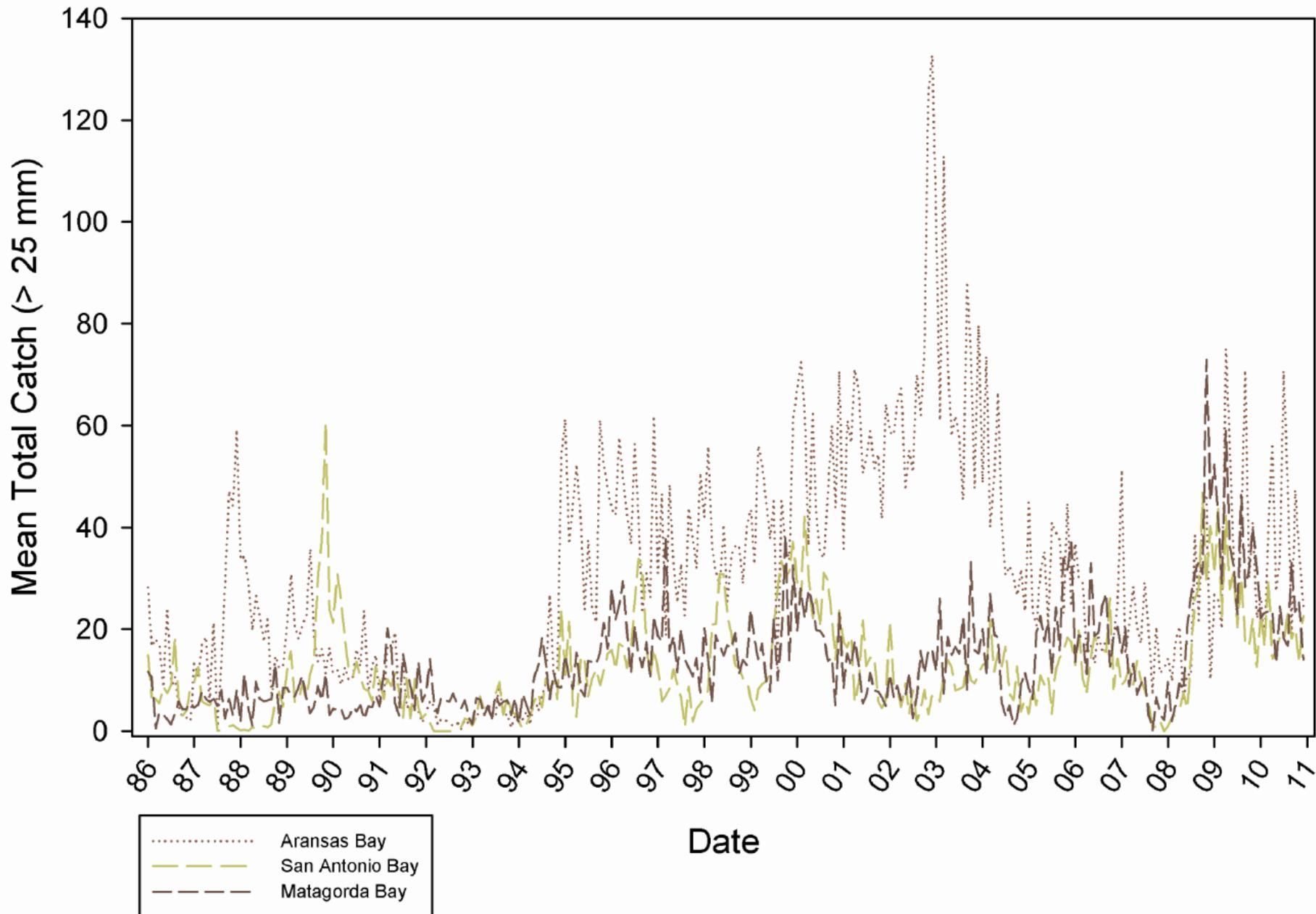
N = 906  
Mean = 9.488  
SD = 18.909

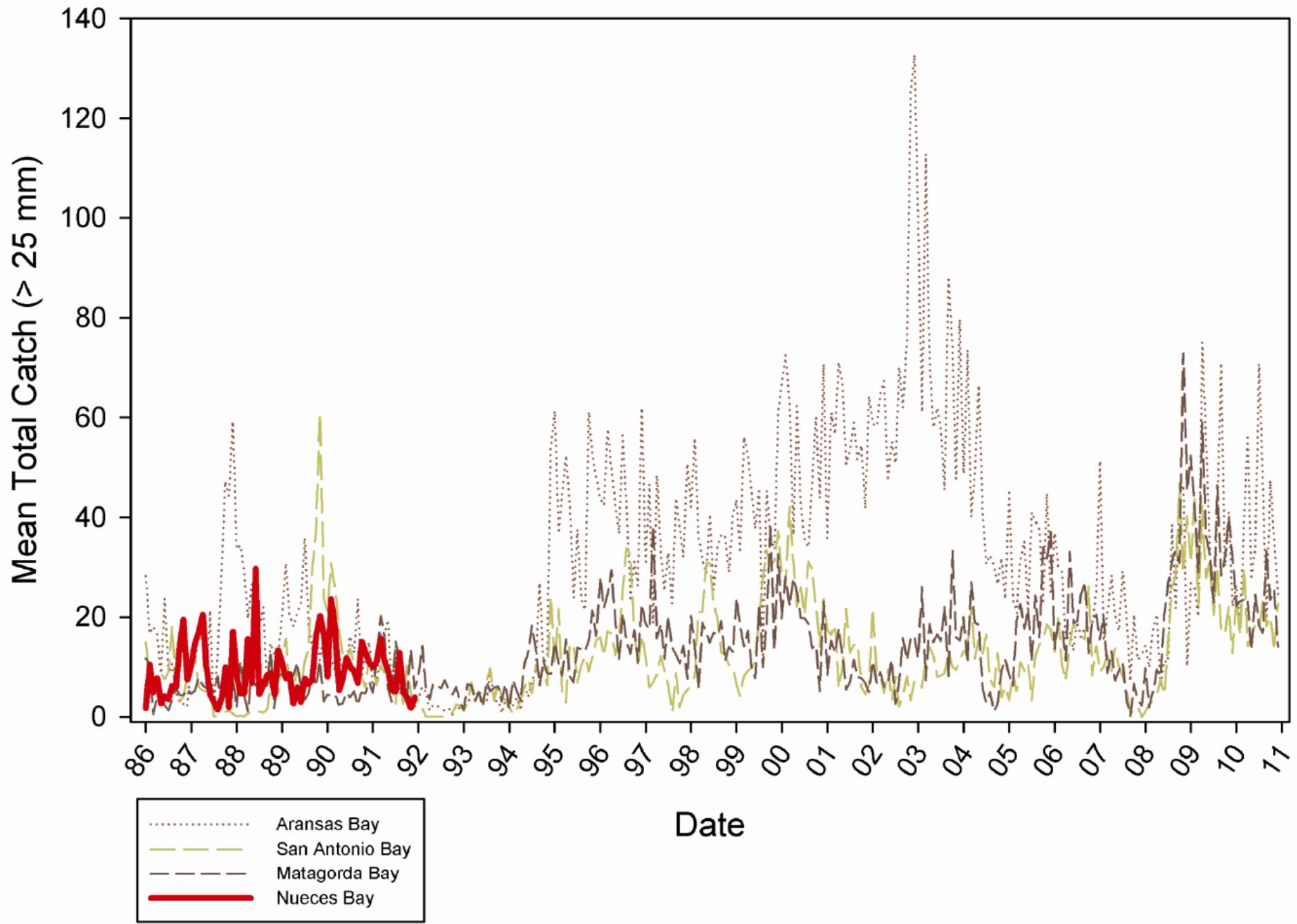


## Series Plot



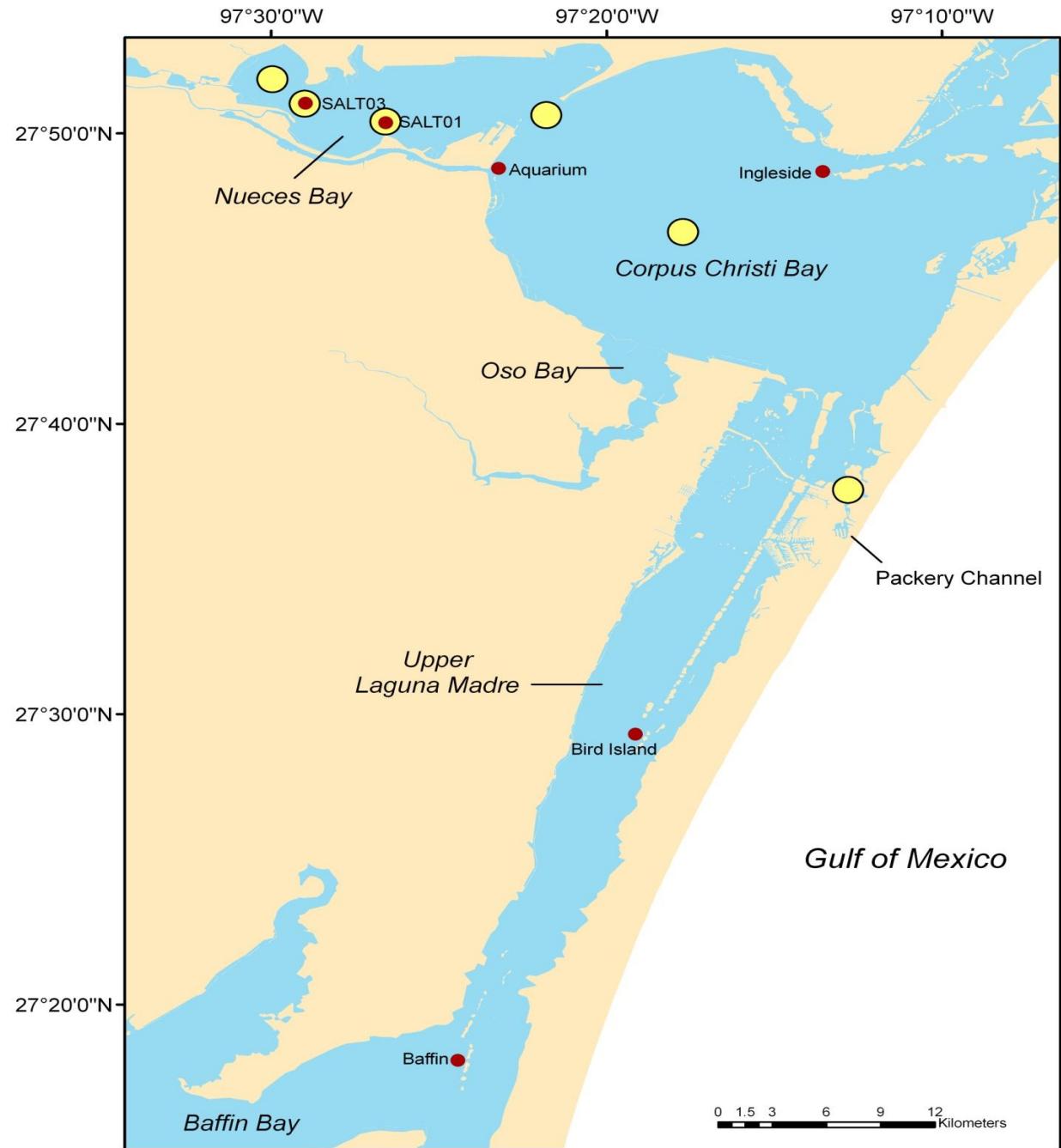


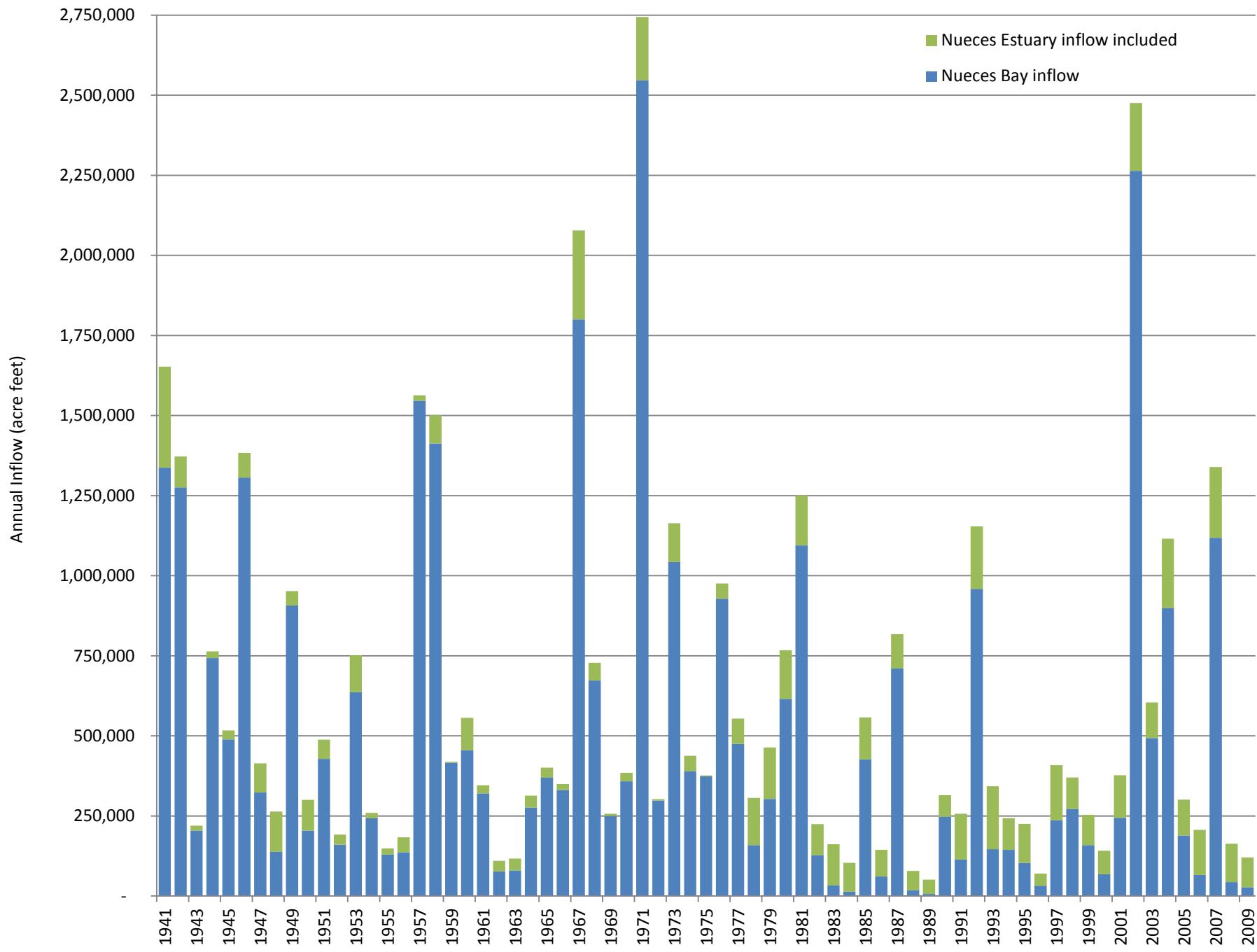


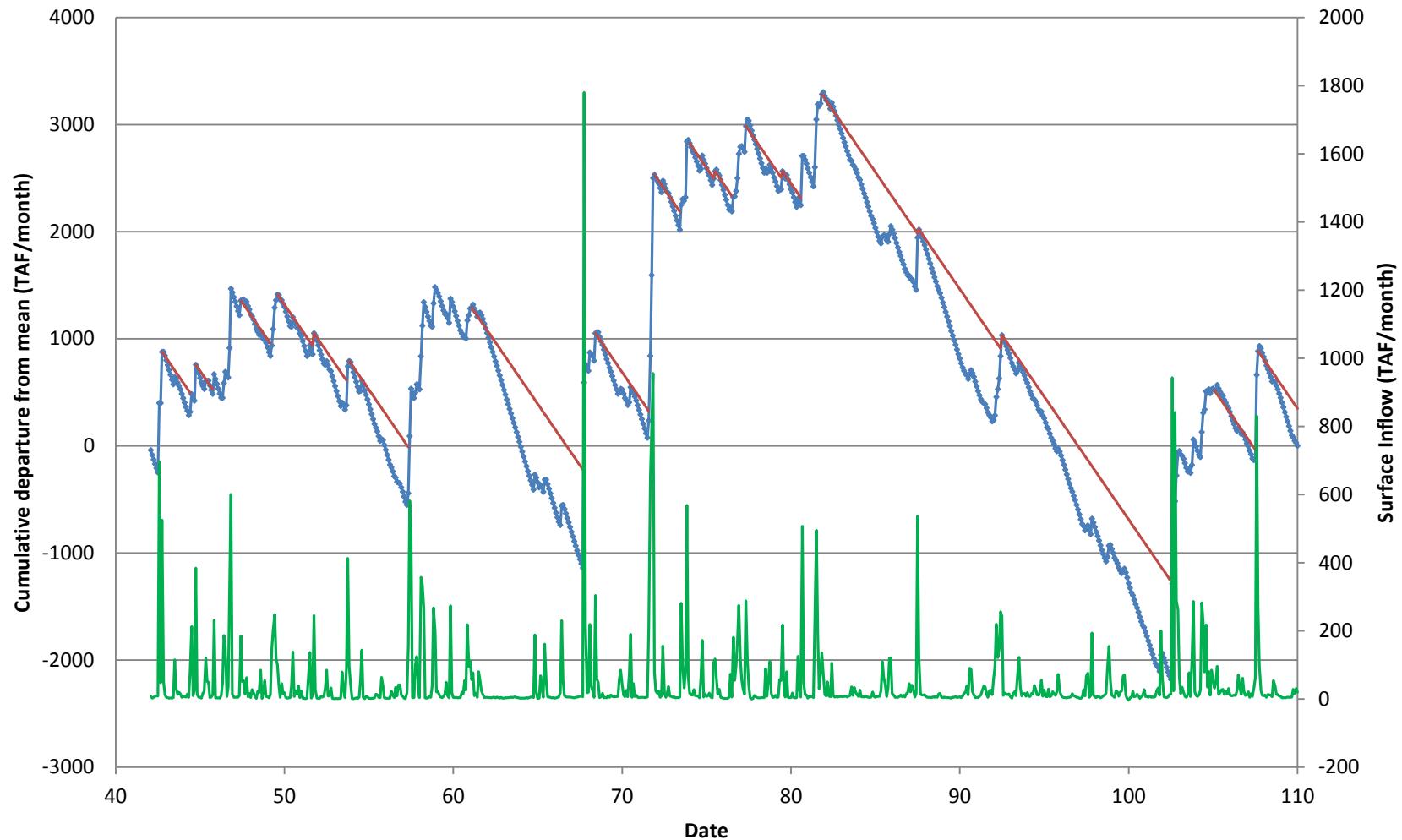


# **Hydrology, Salinity, and Drought Methodology**

**Nowhere else on TX coast  
do we have this much  
empirically measured  
salinity data...**







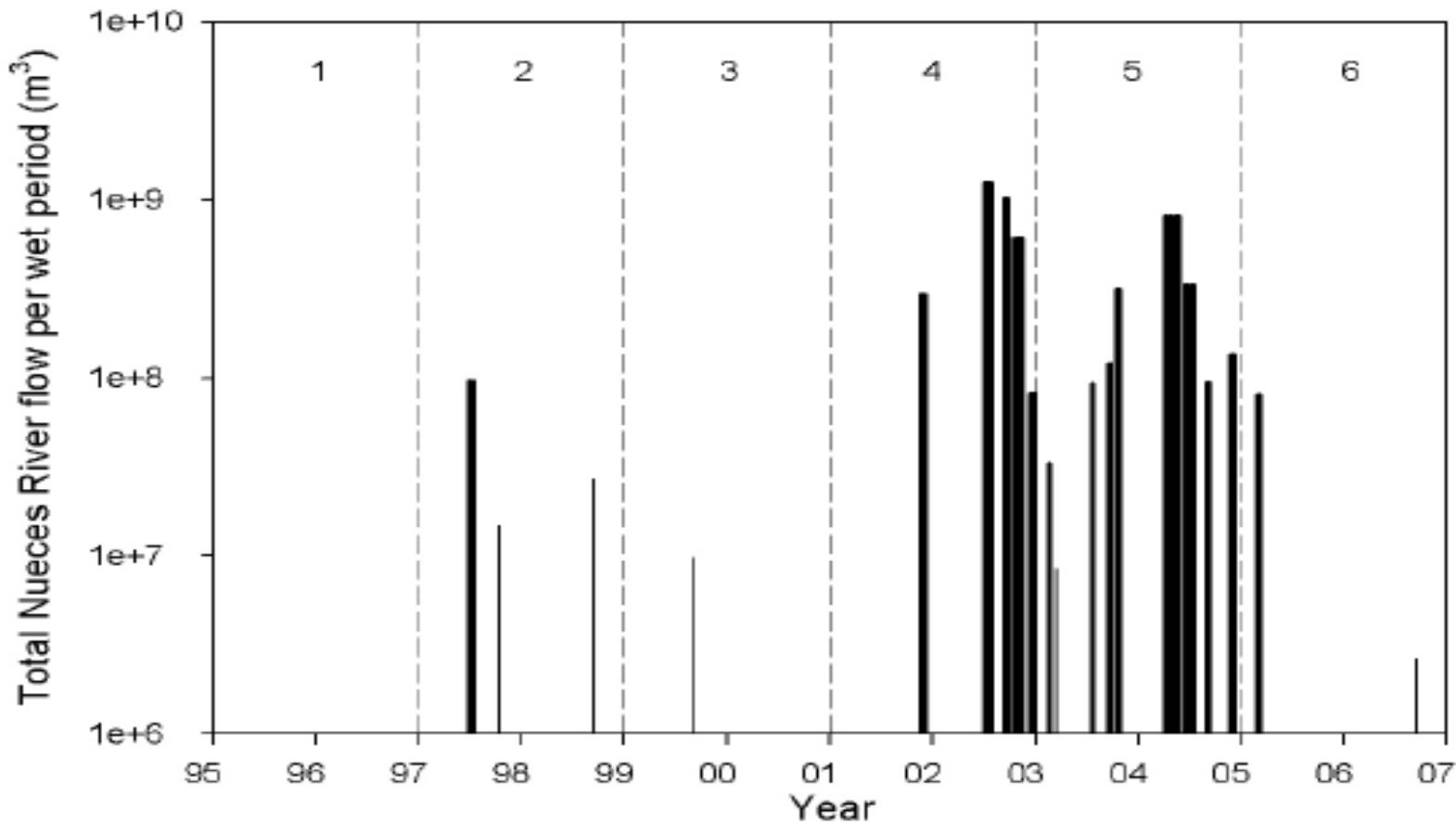


Figure 4. Wet periods over the 170 month study period. From 1 January 1994 to 10 August 2000, wet periods were classified as daily flow rates exceeding  $4.2 \times 10^6 \text{ m}^3$  Nueces River flow. From 11 August 2000 to 29 February 2008 wet periods were classified as daily flow rates exceeding  $2.6 \times 10^6 \text{ m}^3$  Nueces River flow.

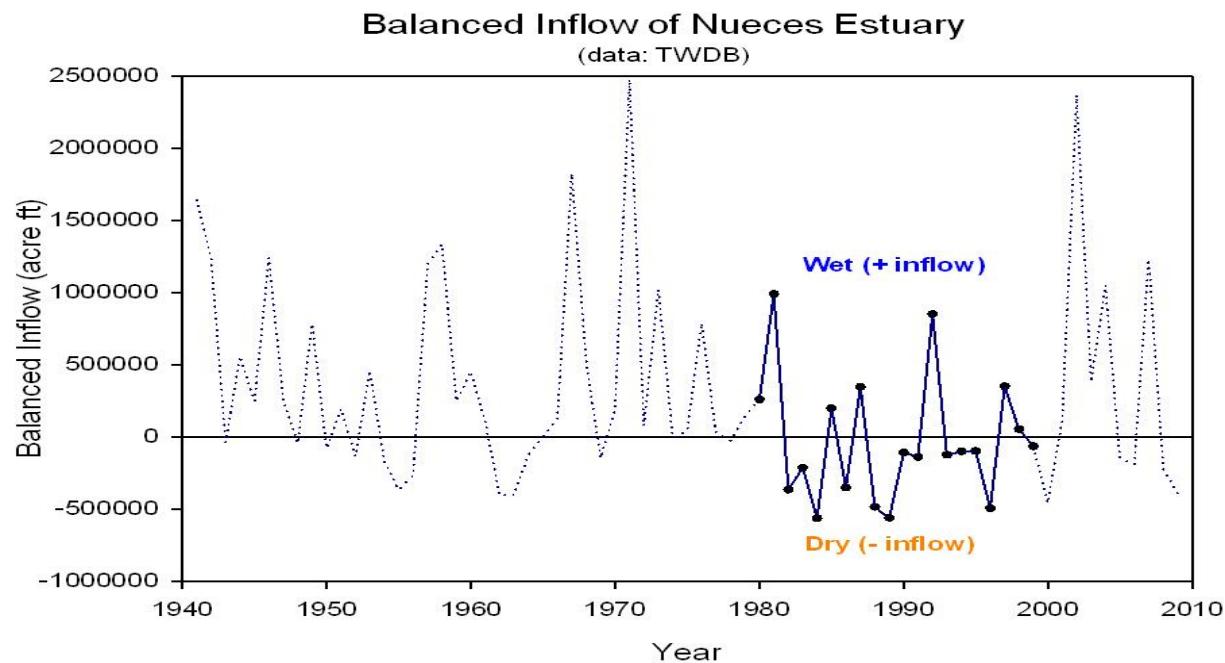
**Wet 1 – 2003**

**Wet 2 – 2004**

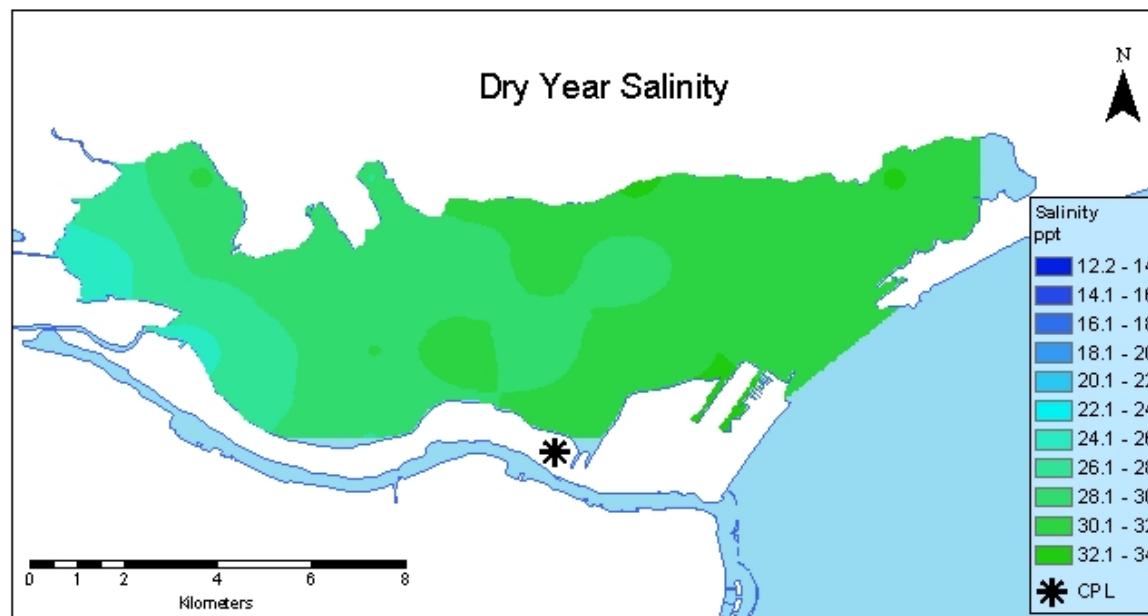
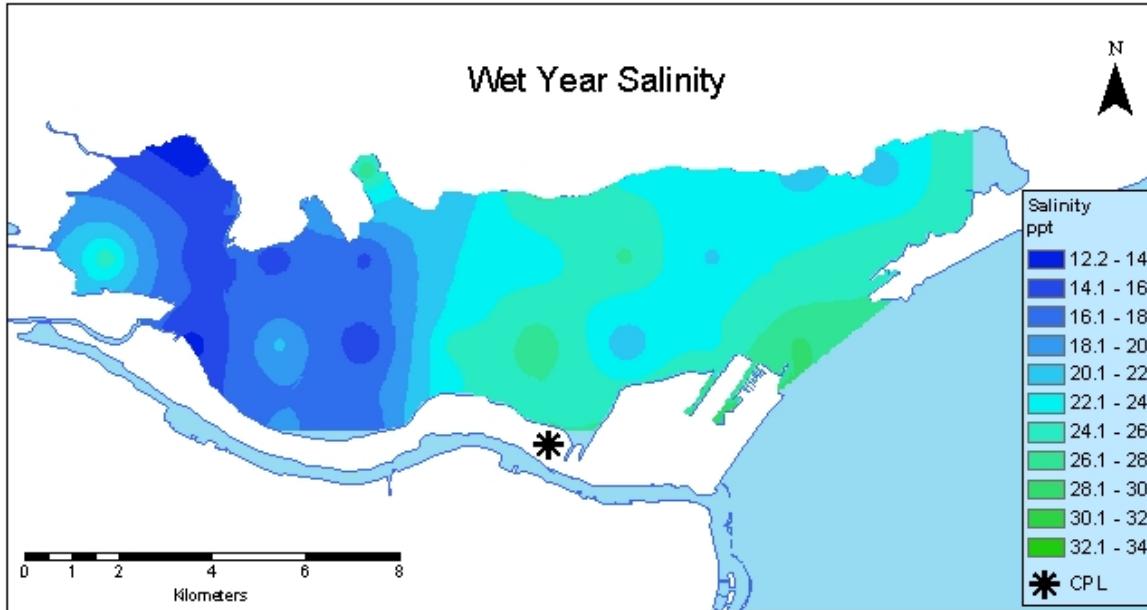
**Average – 1997**

**Dry - 1996**

Data Courtesy Ken Dunton



Plot of the balanced flows of both the years used in the study and the years outside the study (dotted).



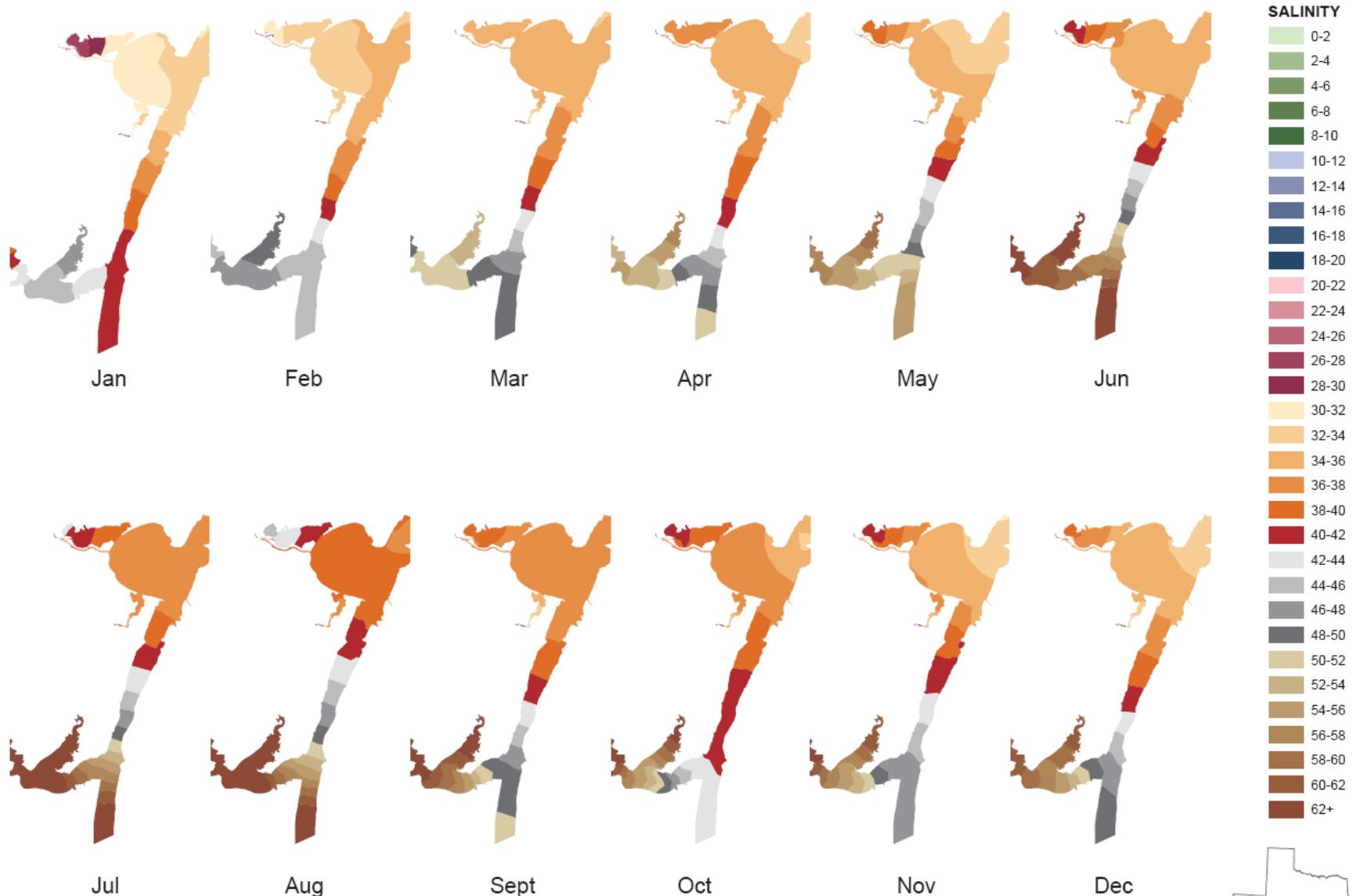
**1980 - 1999**

Data Courtesy Terry Palmer and Paul Montagna

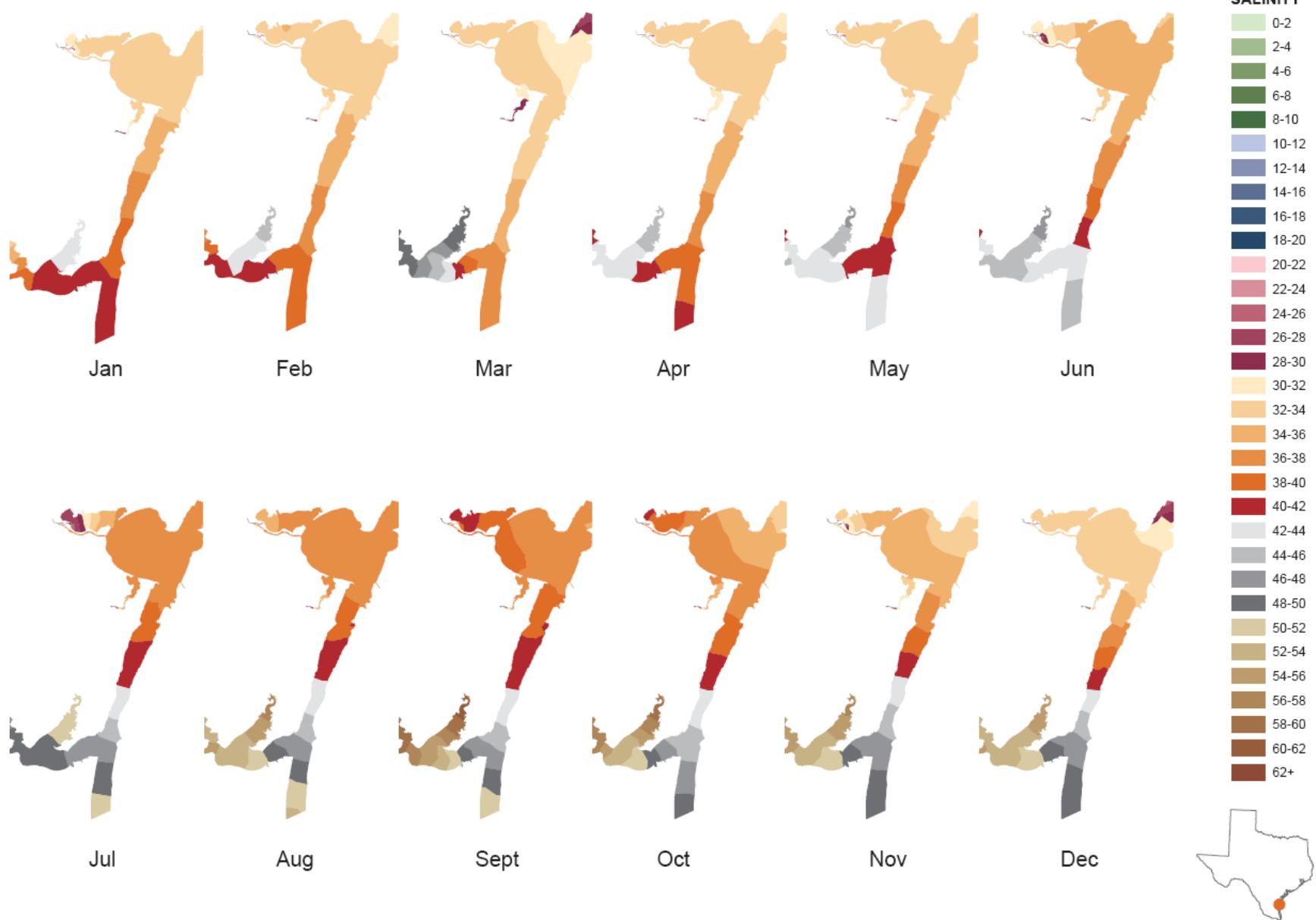
## Annual Average Salinity (an average of the average monthly salinity)



## 1996 - Dry Year



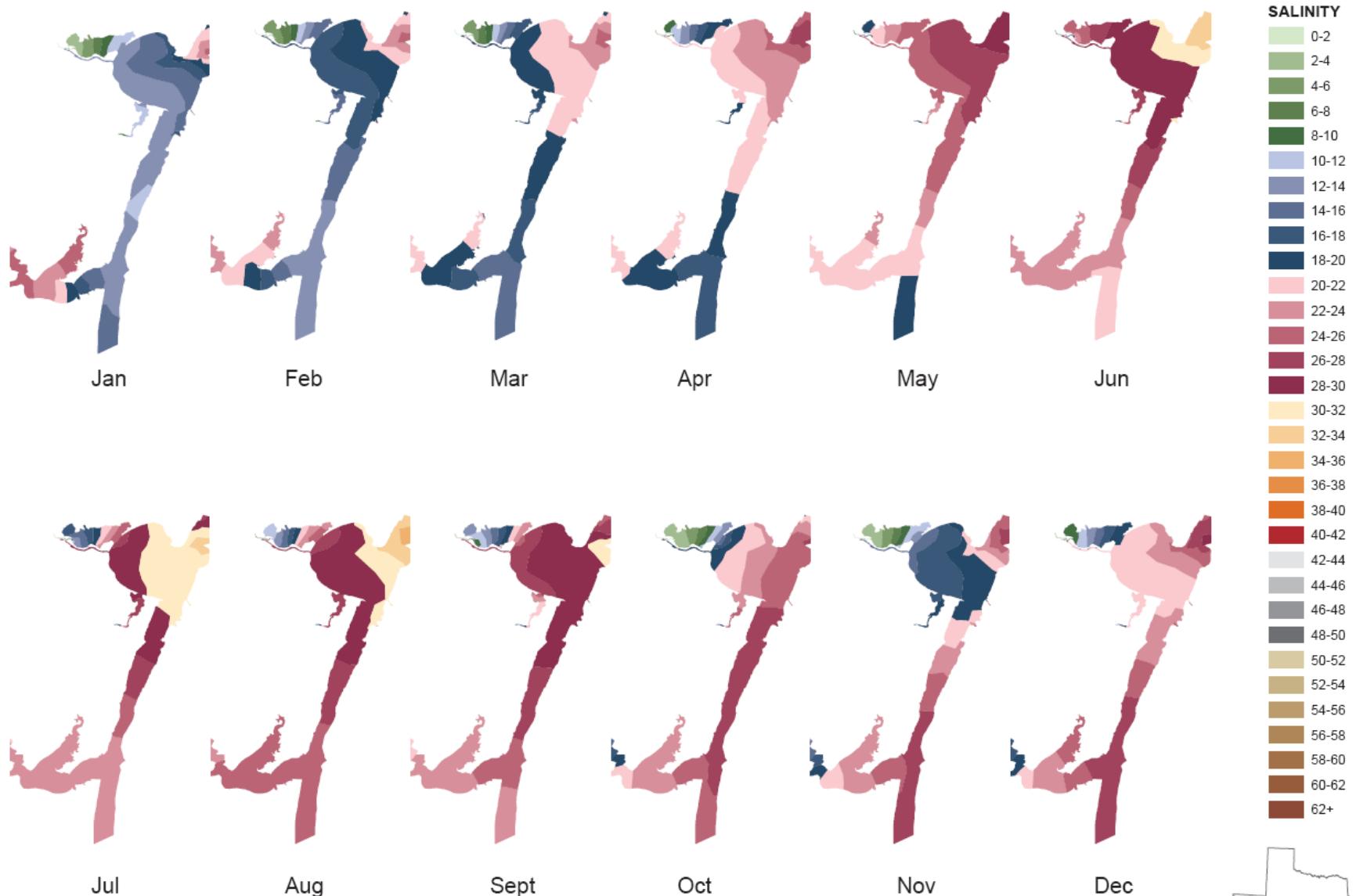
## 2000 - Dry Year



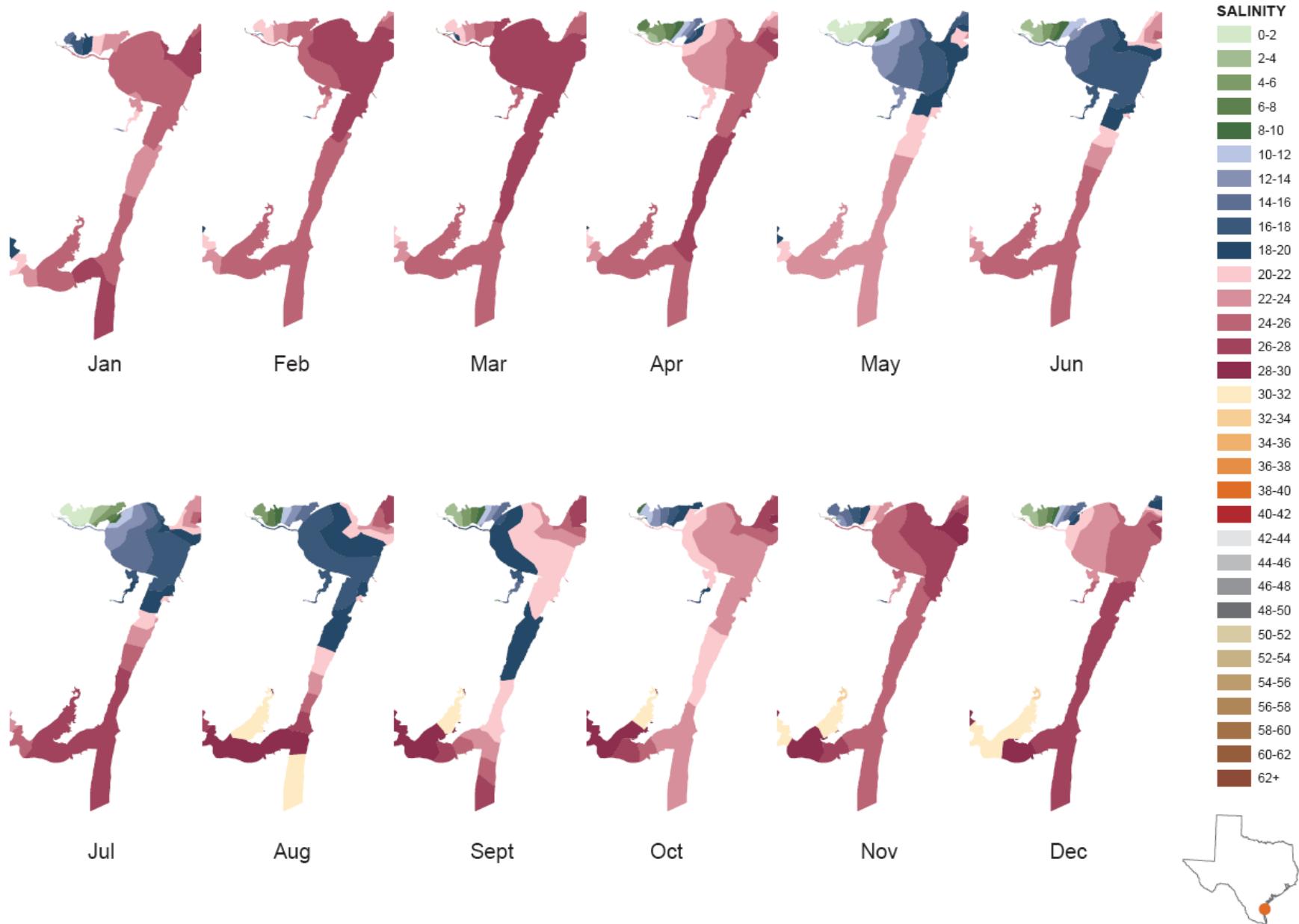
## 1997 - Average Year



## 2003 - Wet Year



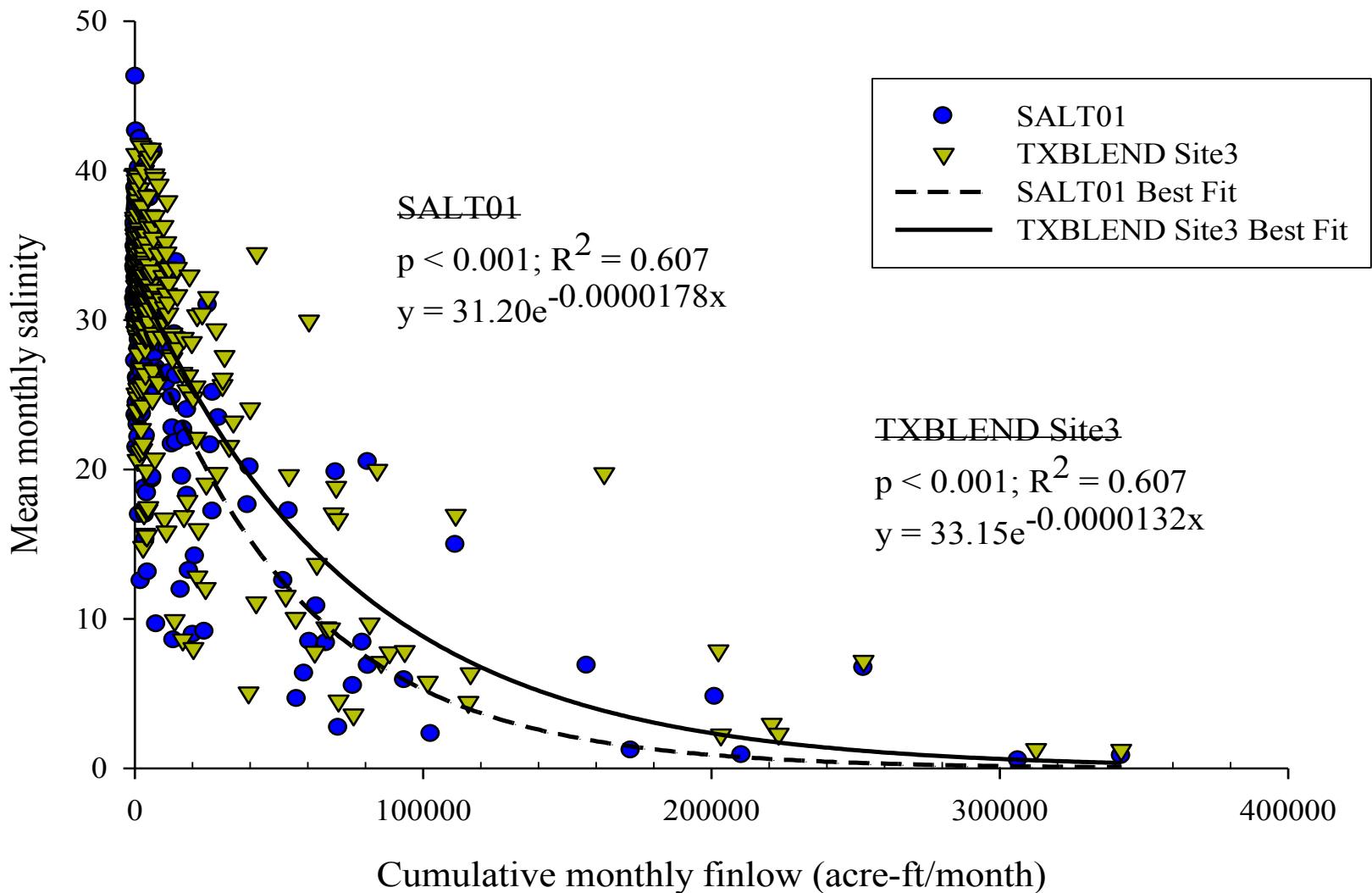
## 2004 - Wet Year



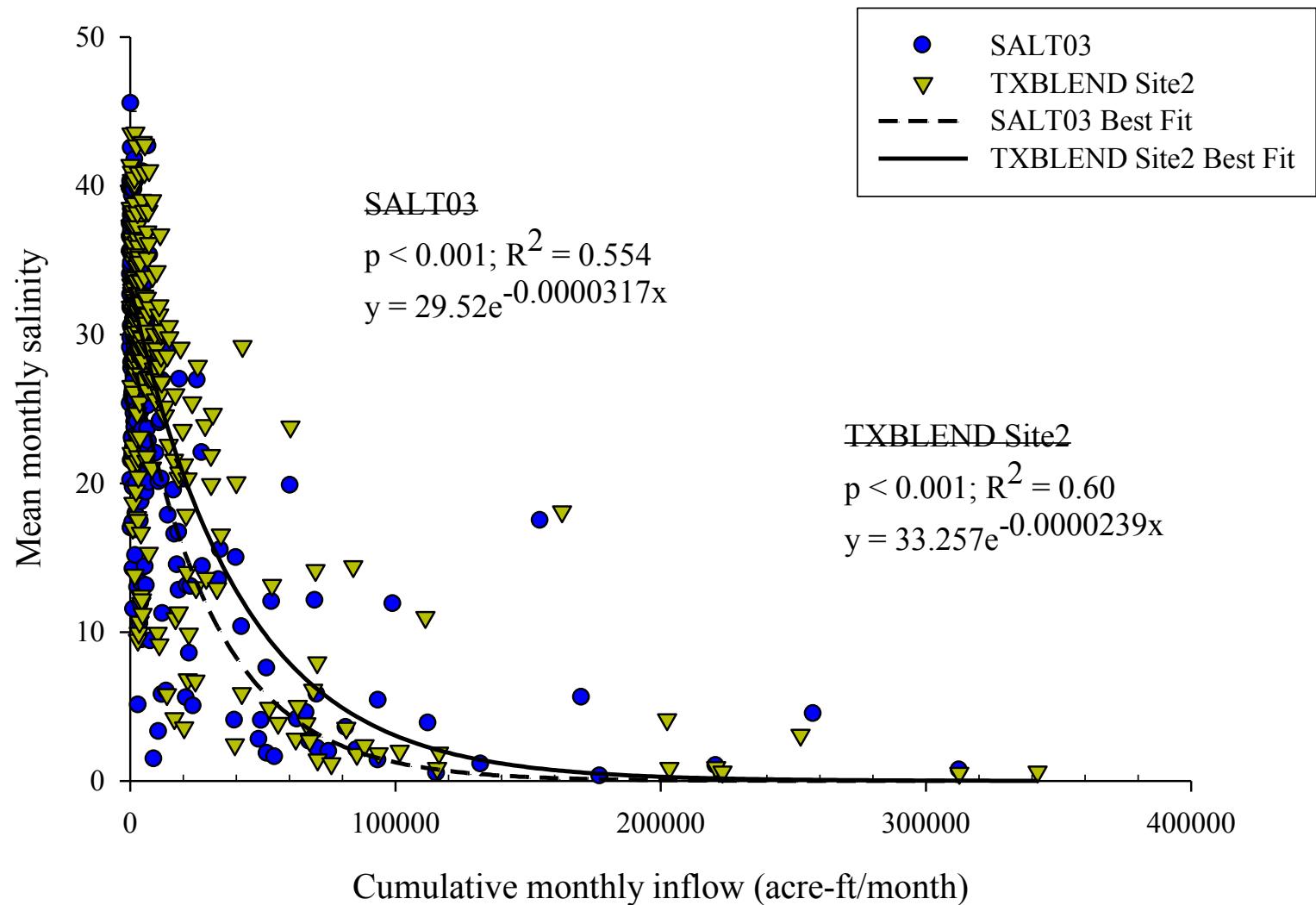
**Nowhere else on TX coast  
do we have this much  
empirically measured  
salinity data...**



# SALT01 and TXBLEND Site 3

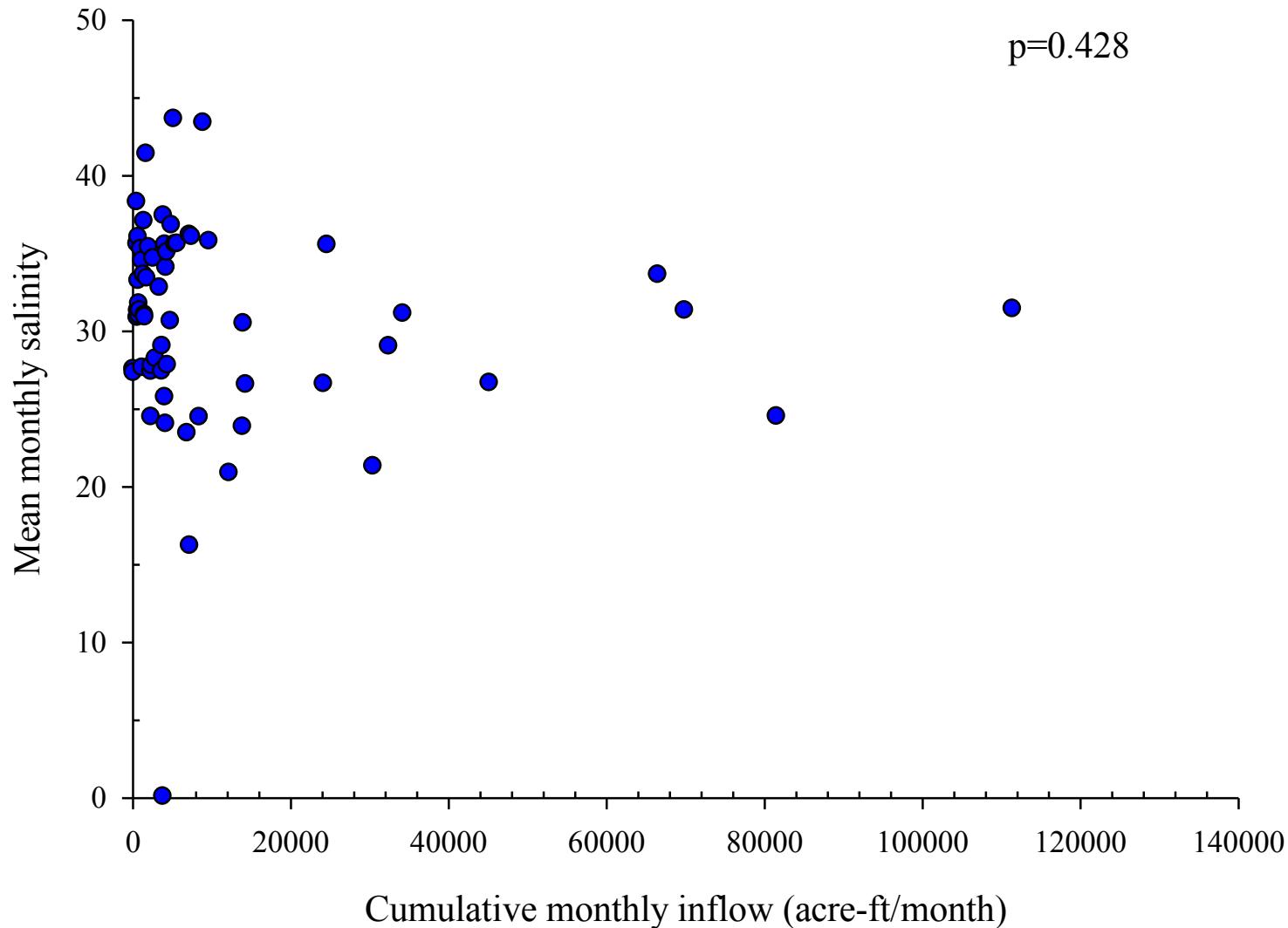


## SALT03 and TXBLEND Site2

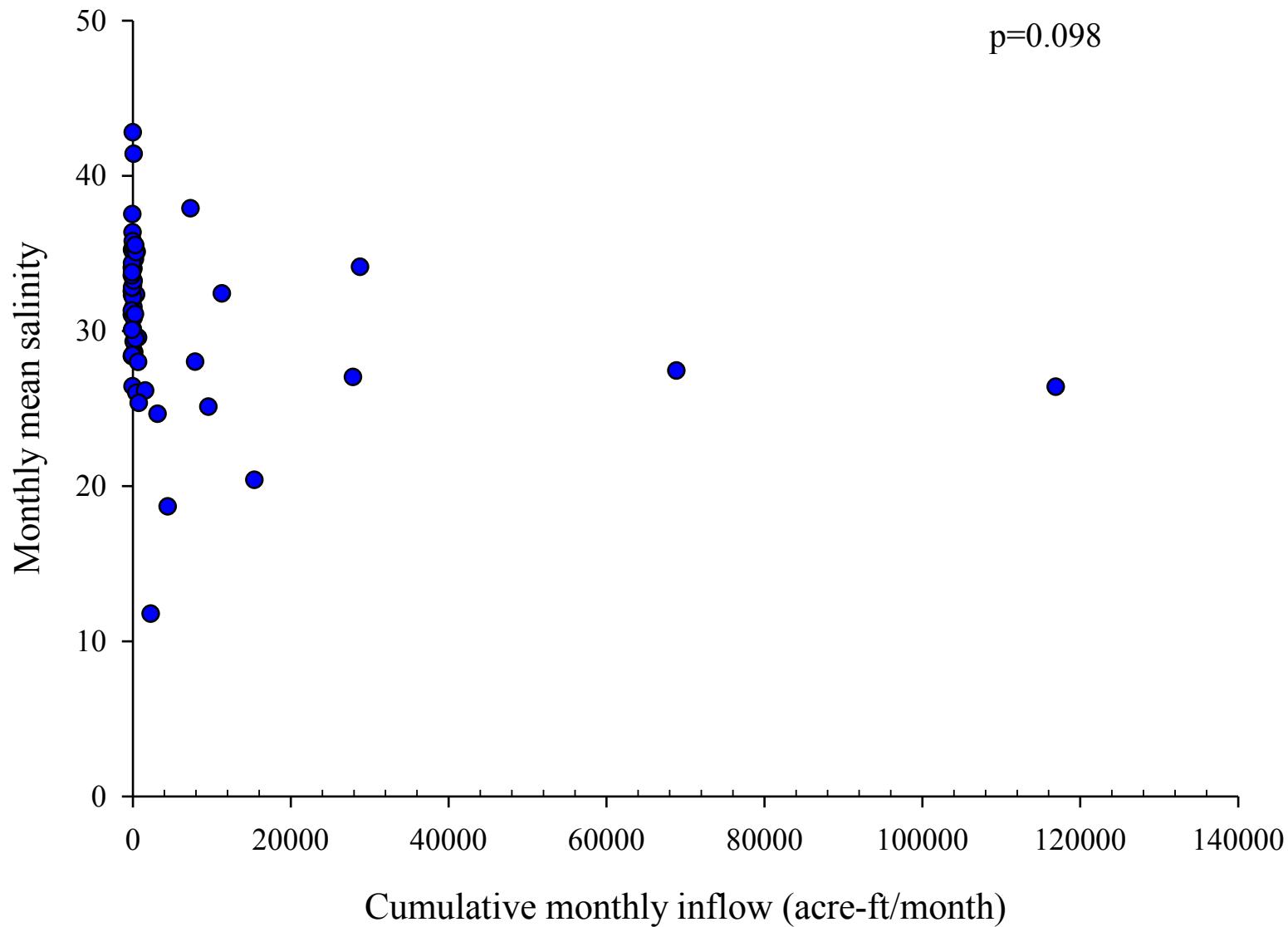


# **Influence of Nueces Bay on Corpus Christi Bay**

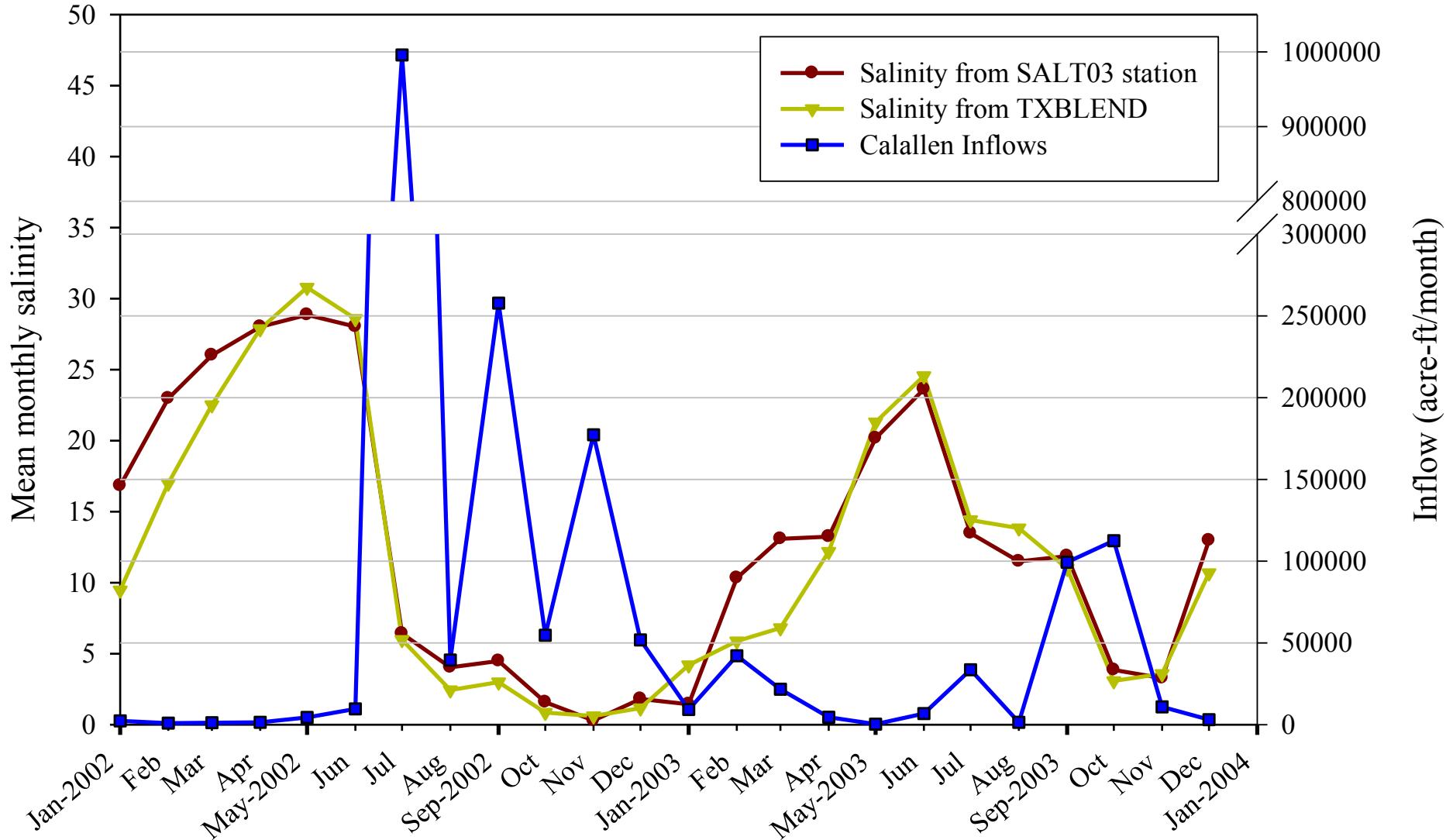
## Ingleside Station 2003-2009



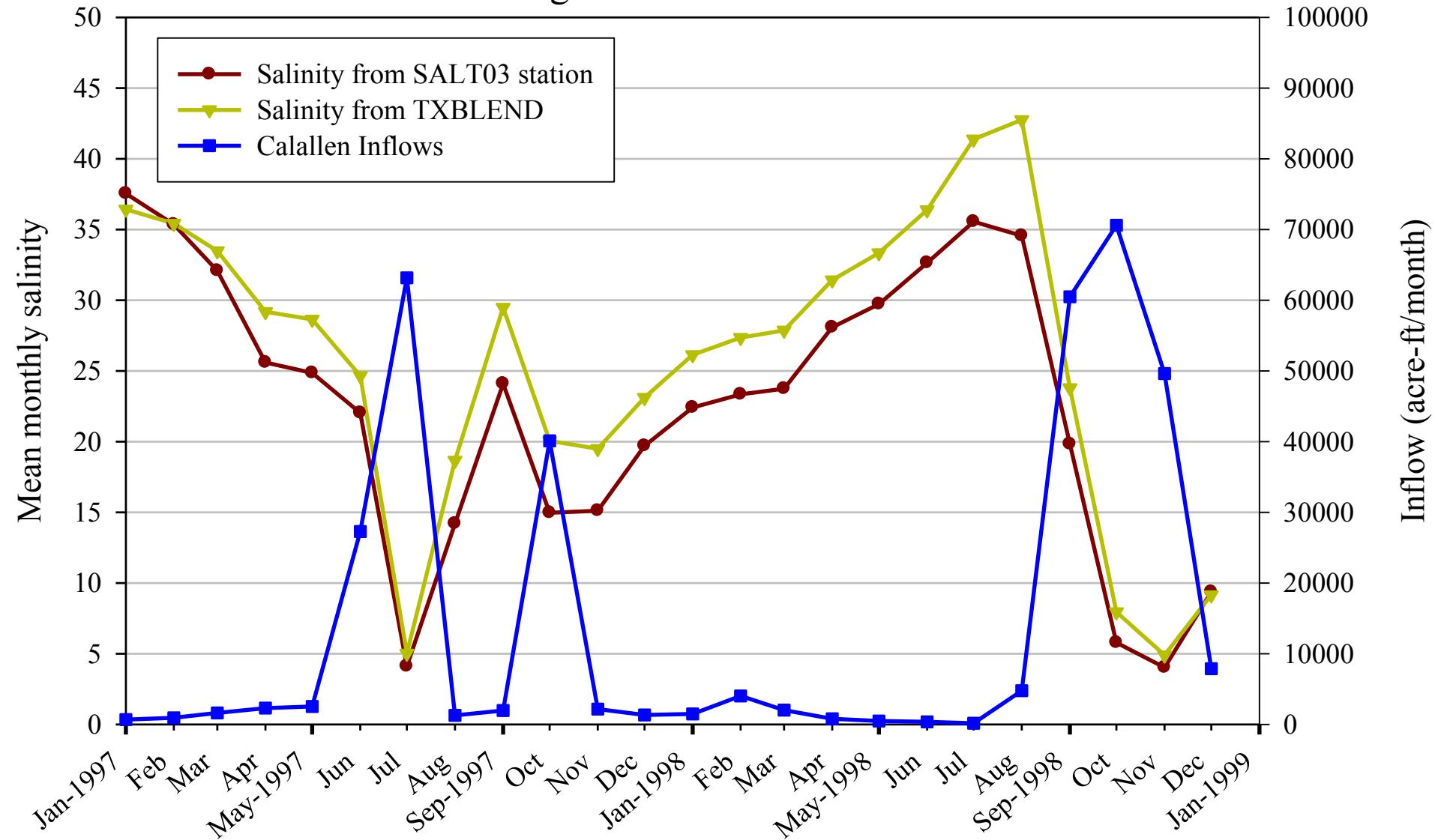
# Aquarium Station 1990-2009



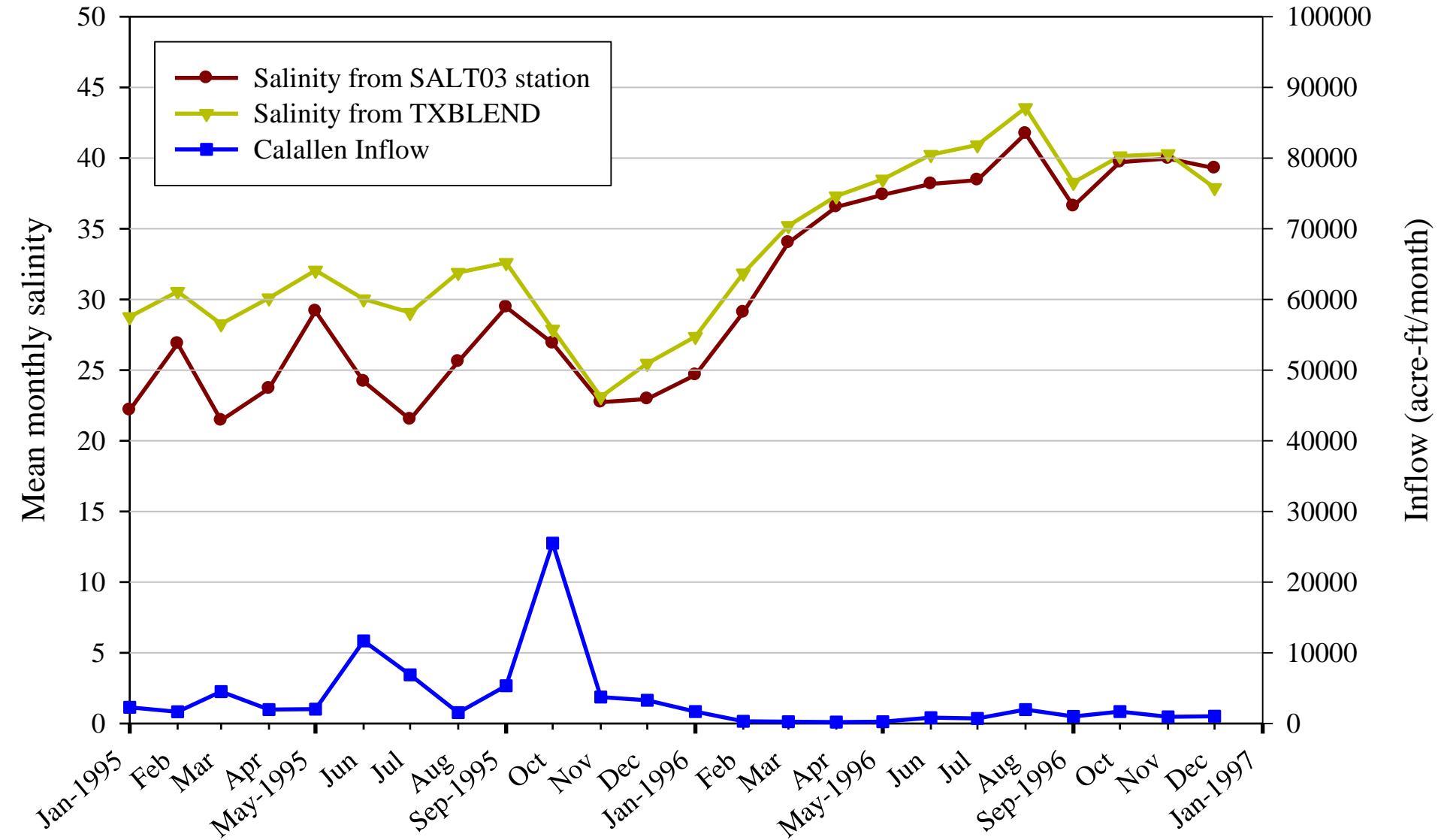
## Wet Years 2002-2003



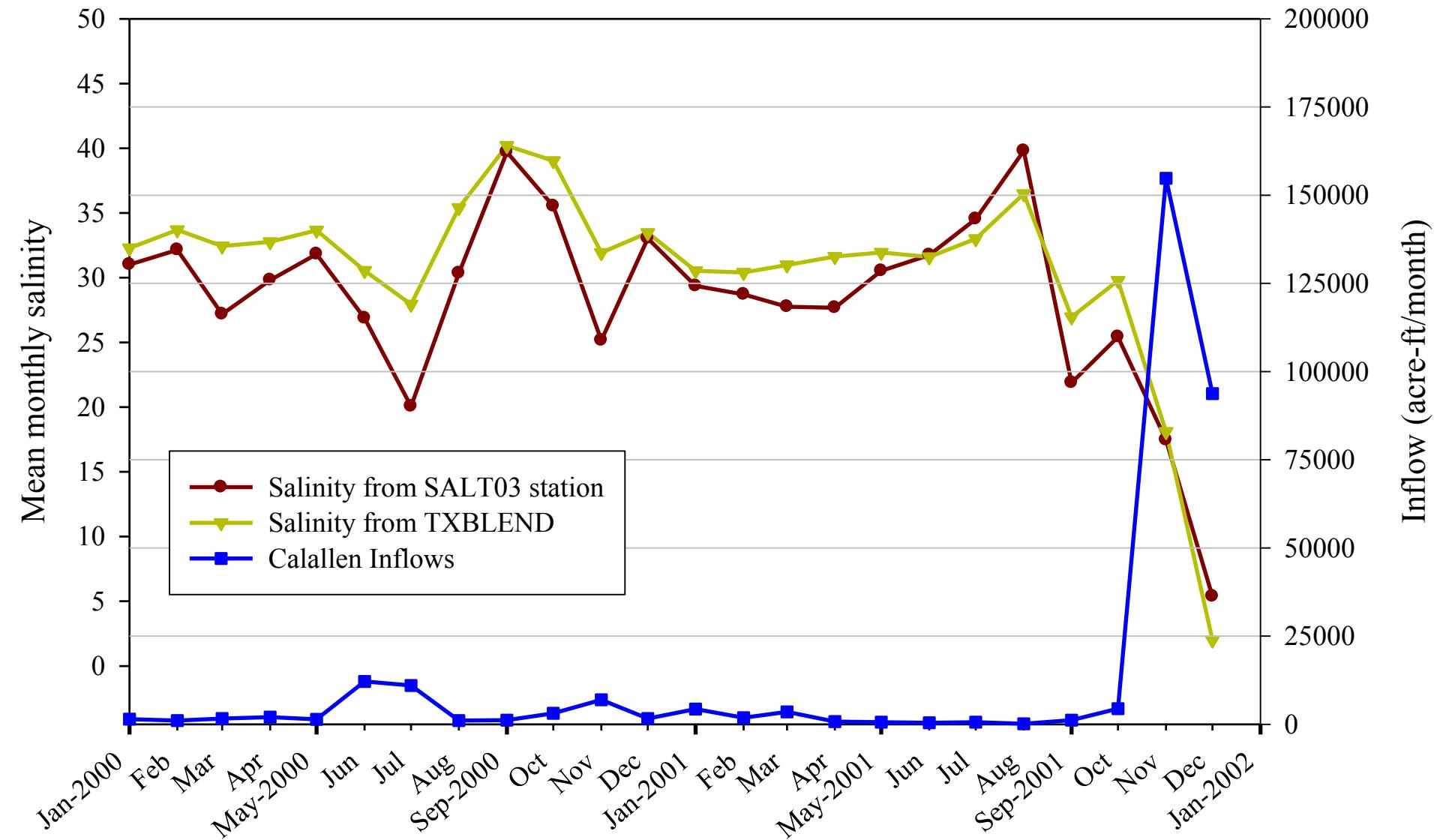
## Average Years 1997-1998



## Dry Year 1995-1996



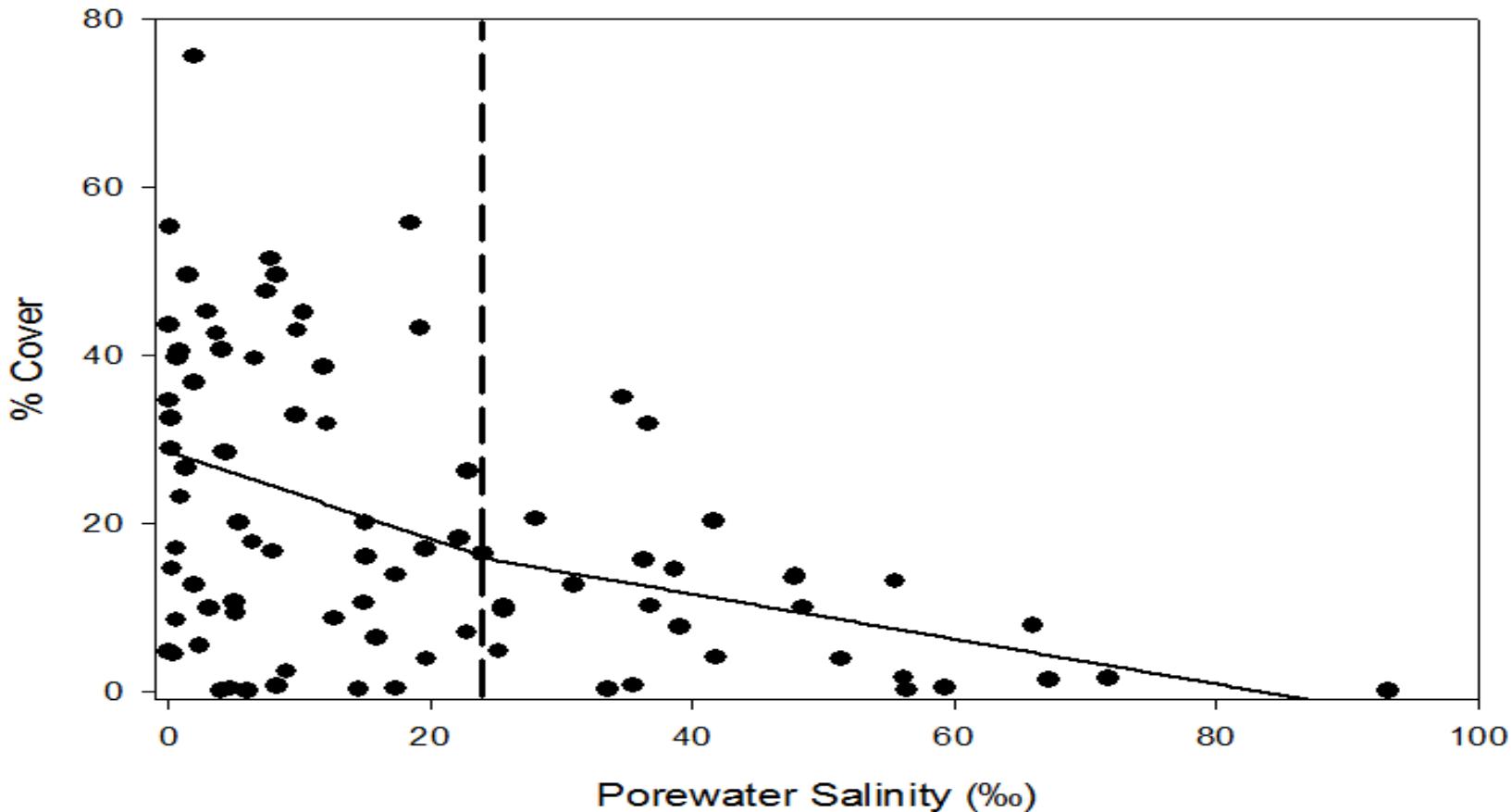
## Dry Years 2000-2001



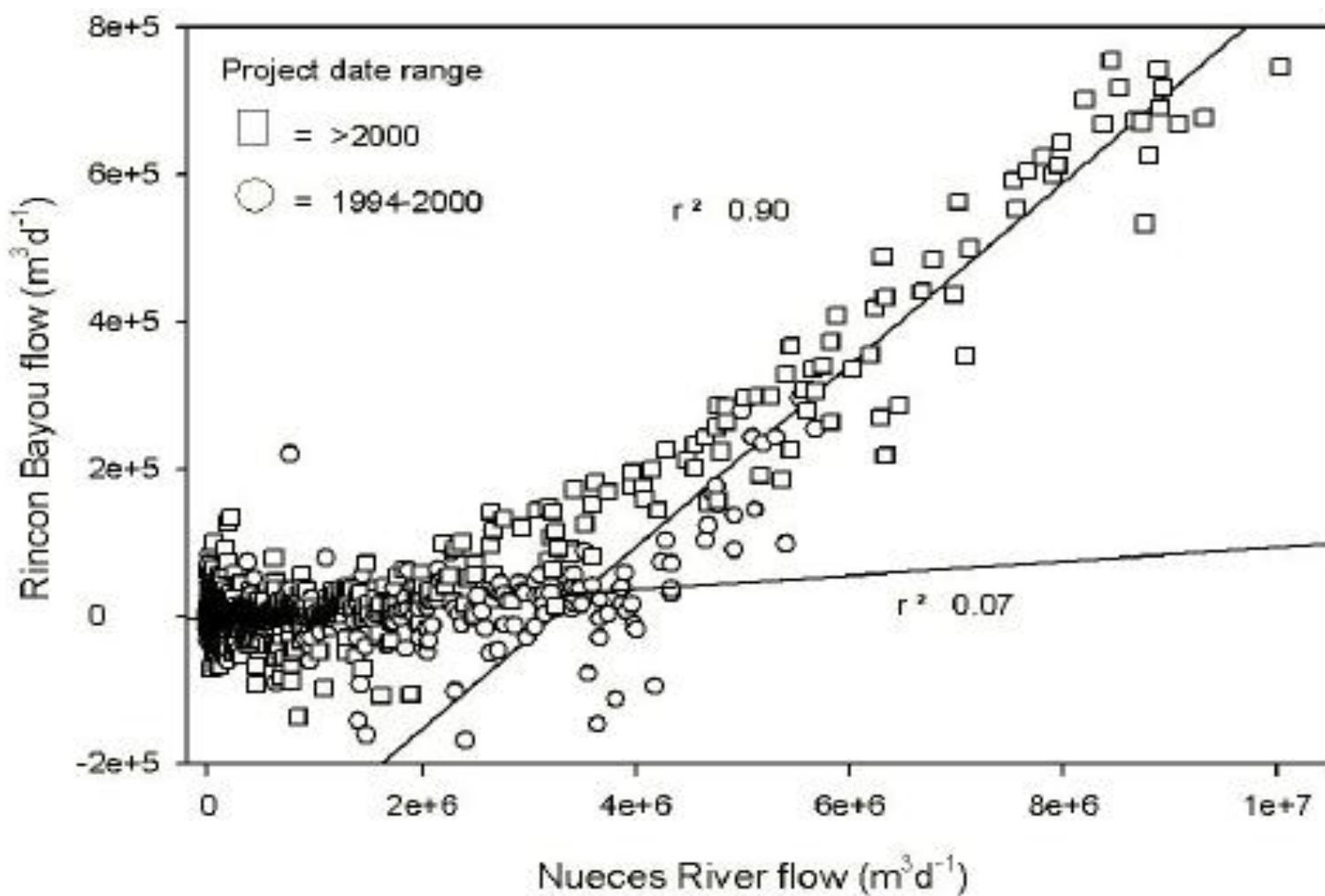
# **Indicator Species**

## **Marsh Vegetation**

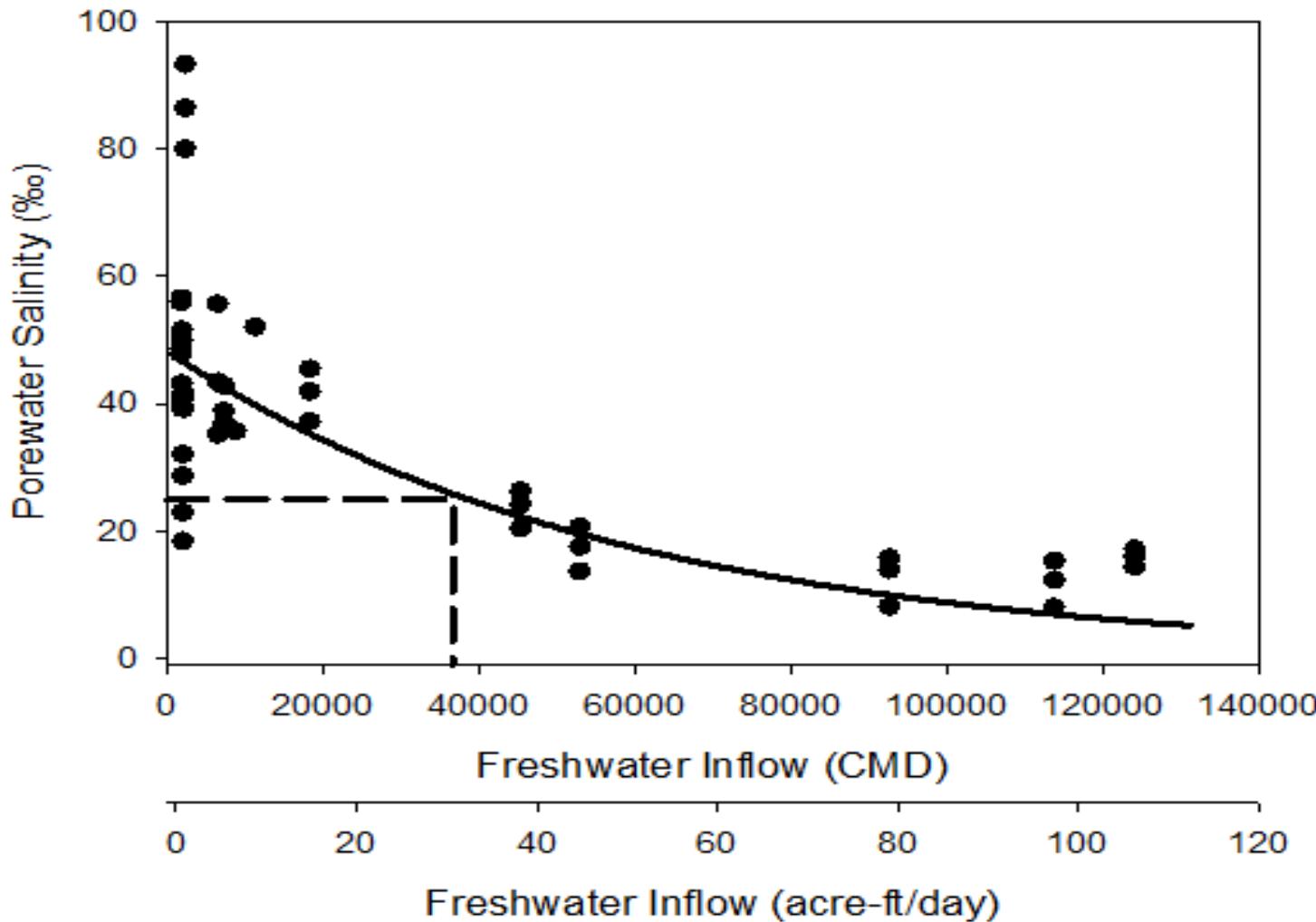
### *Spartina alterniflora*



Relationship between cover of *Spartina alterniflora* and porewater salinity. Piecewise linear regression indicates that a breakpoint in the relationship occurs at a porewater salinity of 25‰.



Paired regressions of Rincon Bayou discharge versus Nueces River discharge for no flow and positive flow into Rincon Bayou. Points are labeled by Nueces Overflow Channel project periods. 3000 acre-ft; 1500 CFS



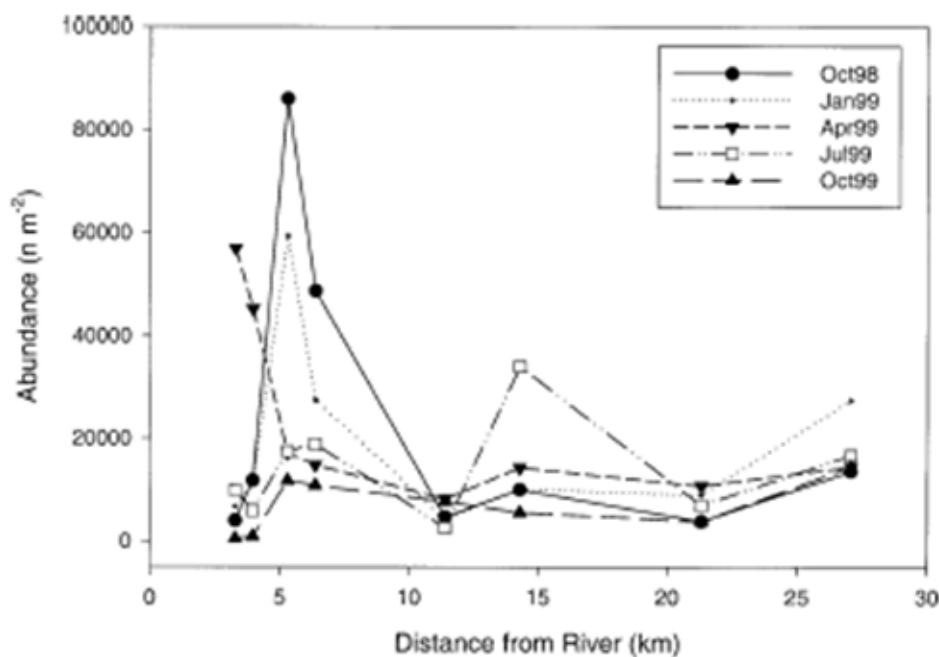
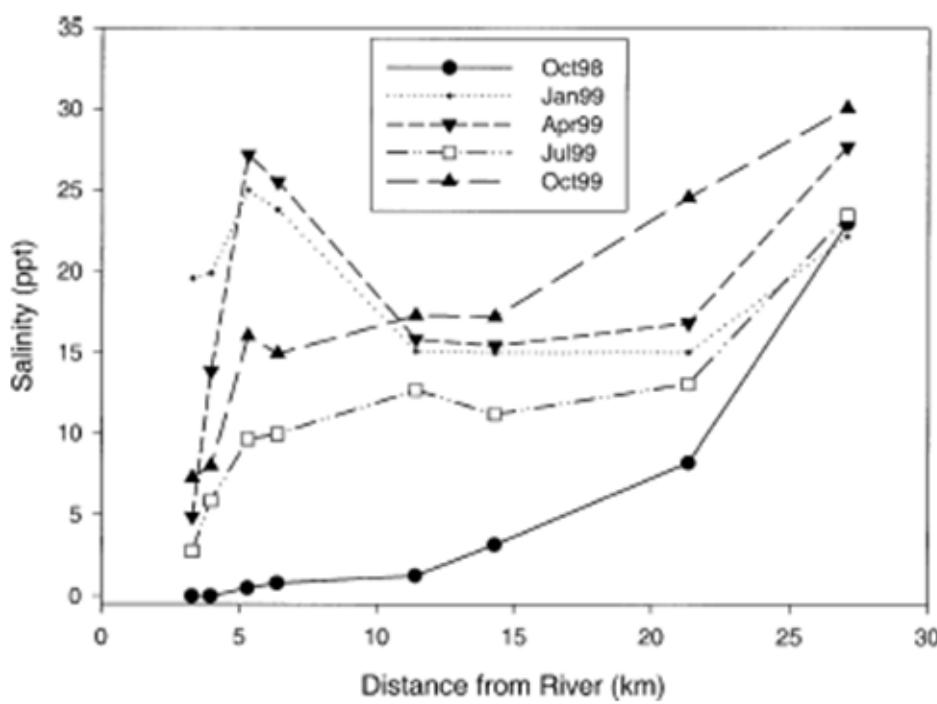
Relationship between freshwater inflow (Rincon Bayou Channel: USGS #08211503) and porewater salinity along the creek bank in the low marsh. Regression curve is a best fit line for an exponential decay function. Dashed line indicates flow required to obtain a salinity target of 25 ‰.

Nueces River Flow (acre-ft)				
Nueces Delta Porewater Salinity Target (‰)	22000	90000	40000	20000
25	Winter	Spring	Summer	Fall

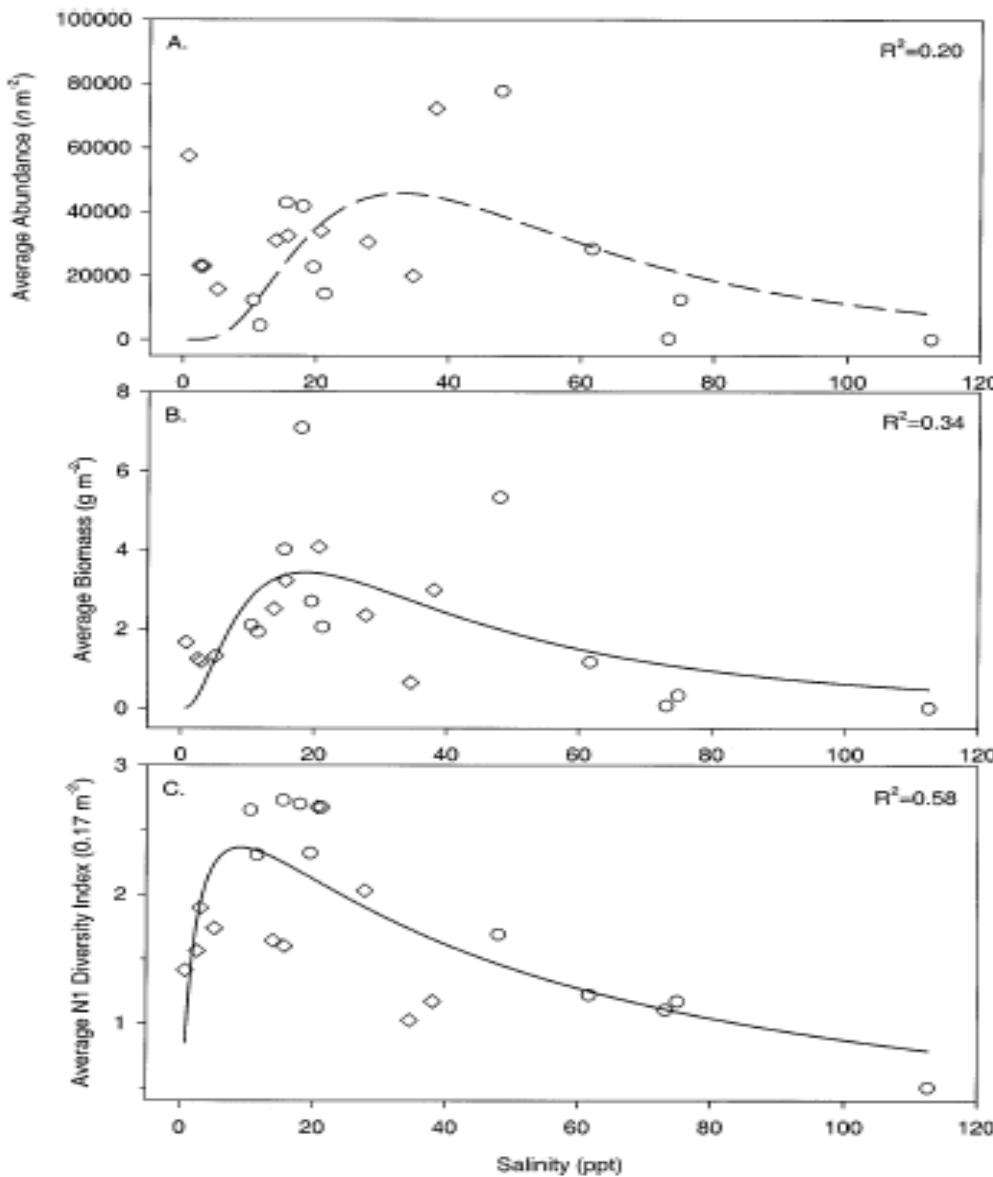
**172,000 acre-ft y<sup>-1</sup>**

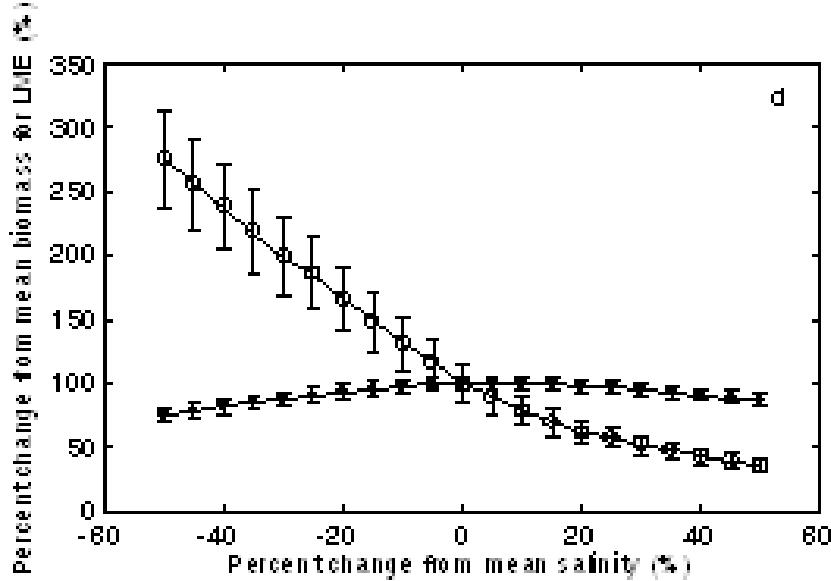
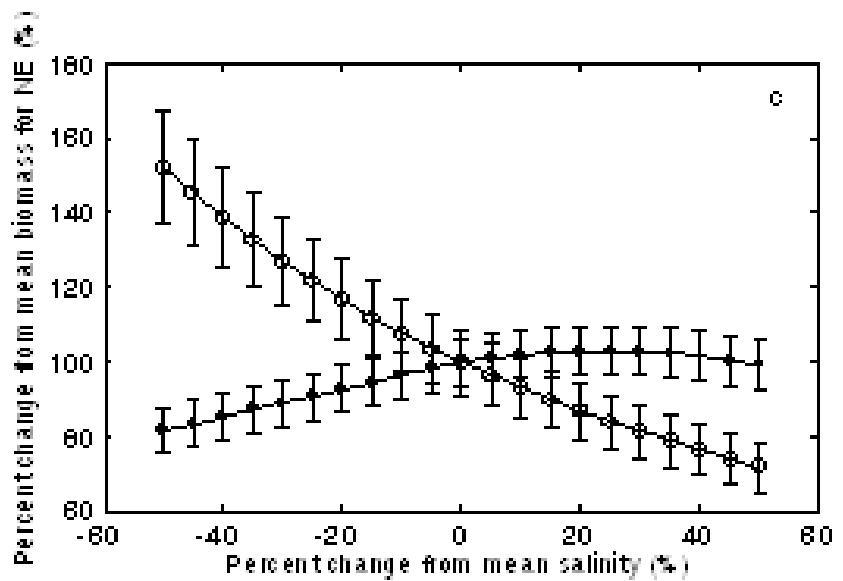
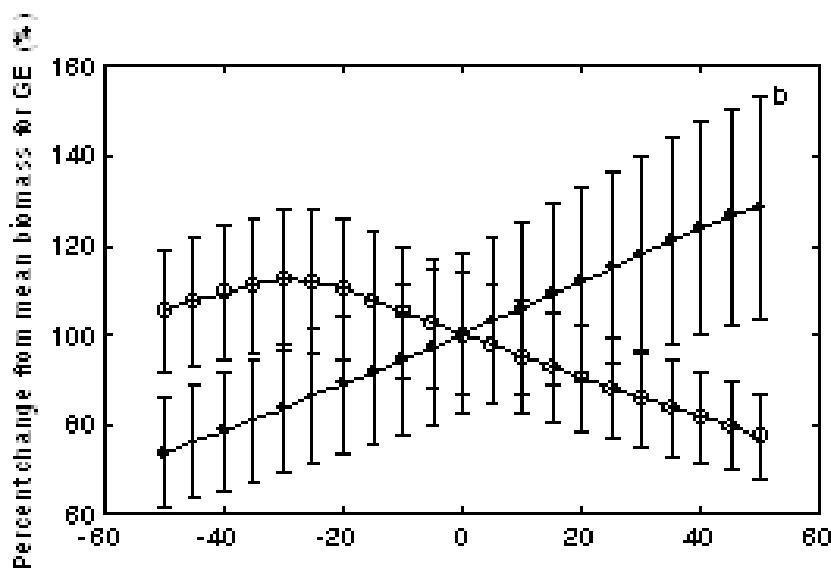
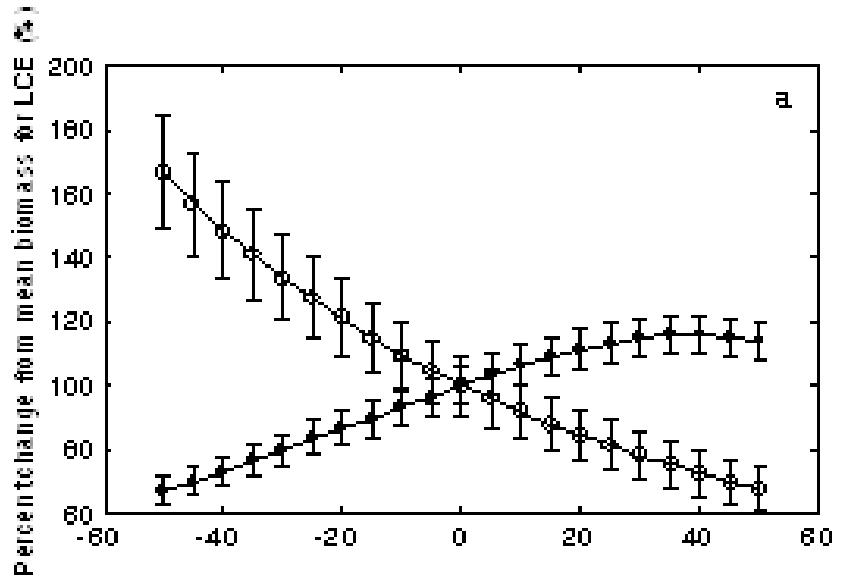
# **Indicator Species**

## **Benthic Infauna**



## Infauna response to salinity





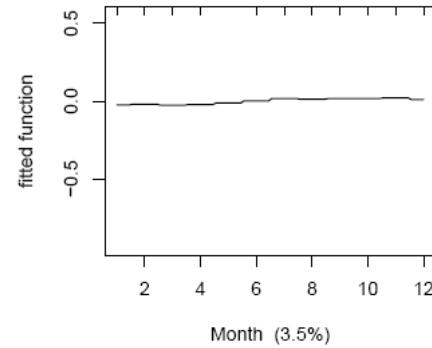
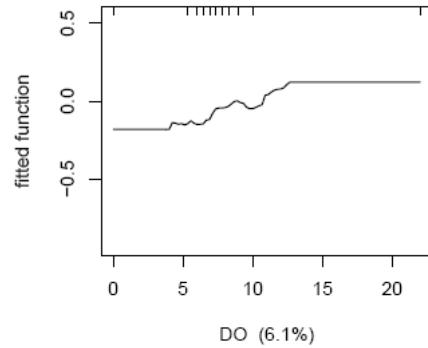
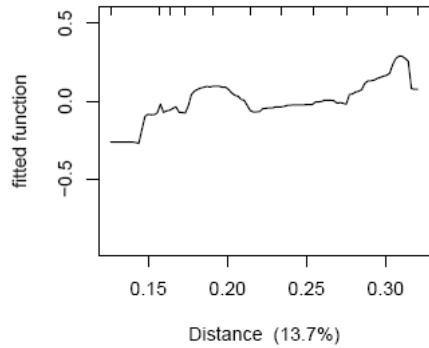
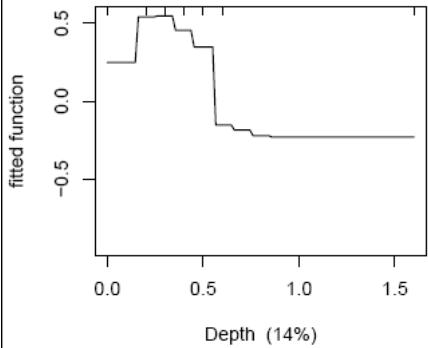
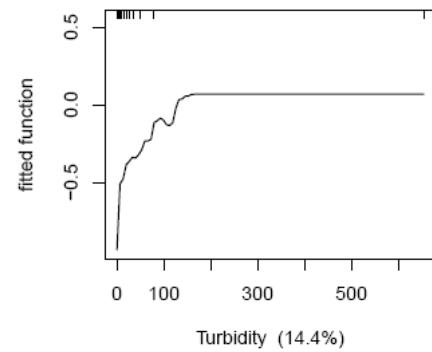
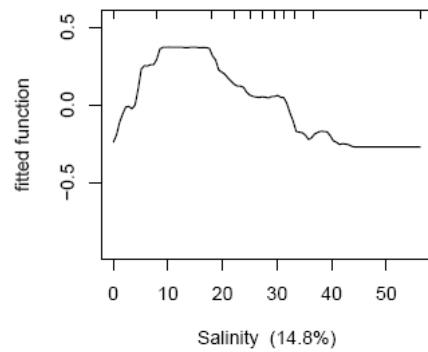
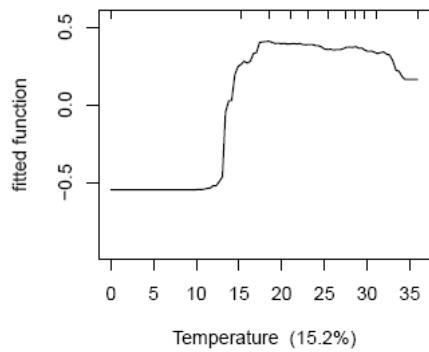
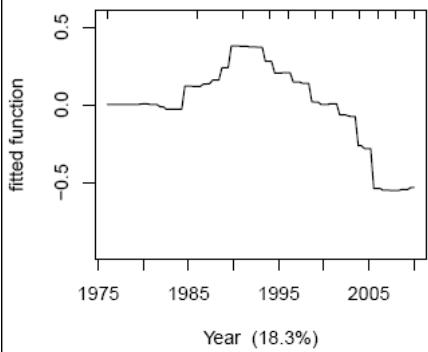
# **Indicator Species**

## **Nekton**

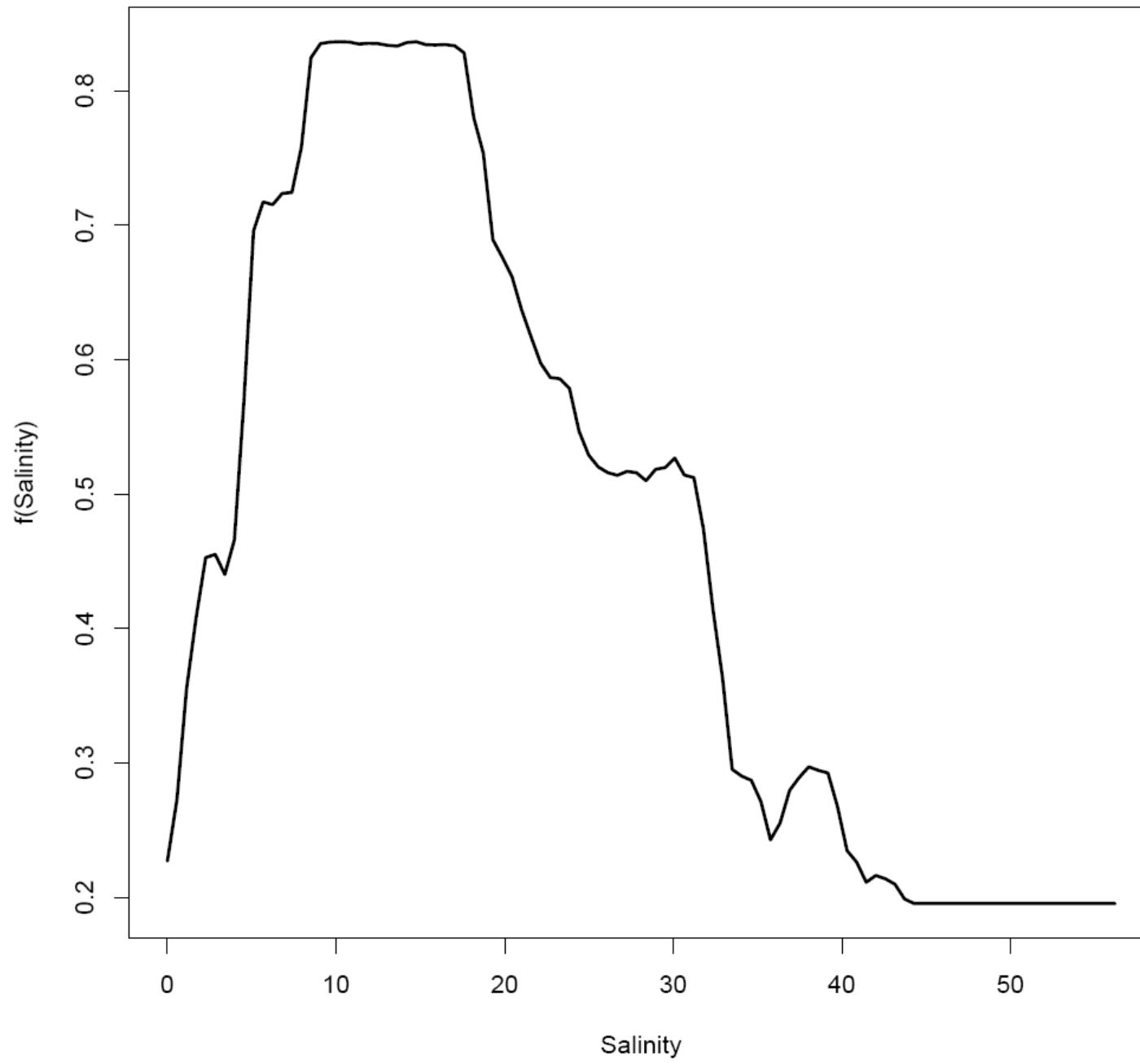
# **Boosted Regression Trees**

**Samples plots for blue crab and A. croaker**

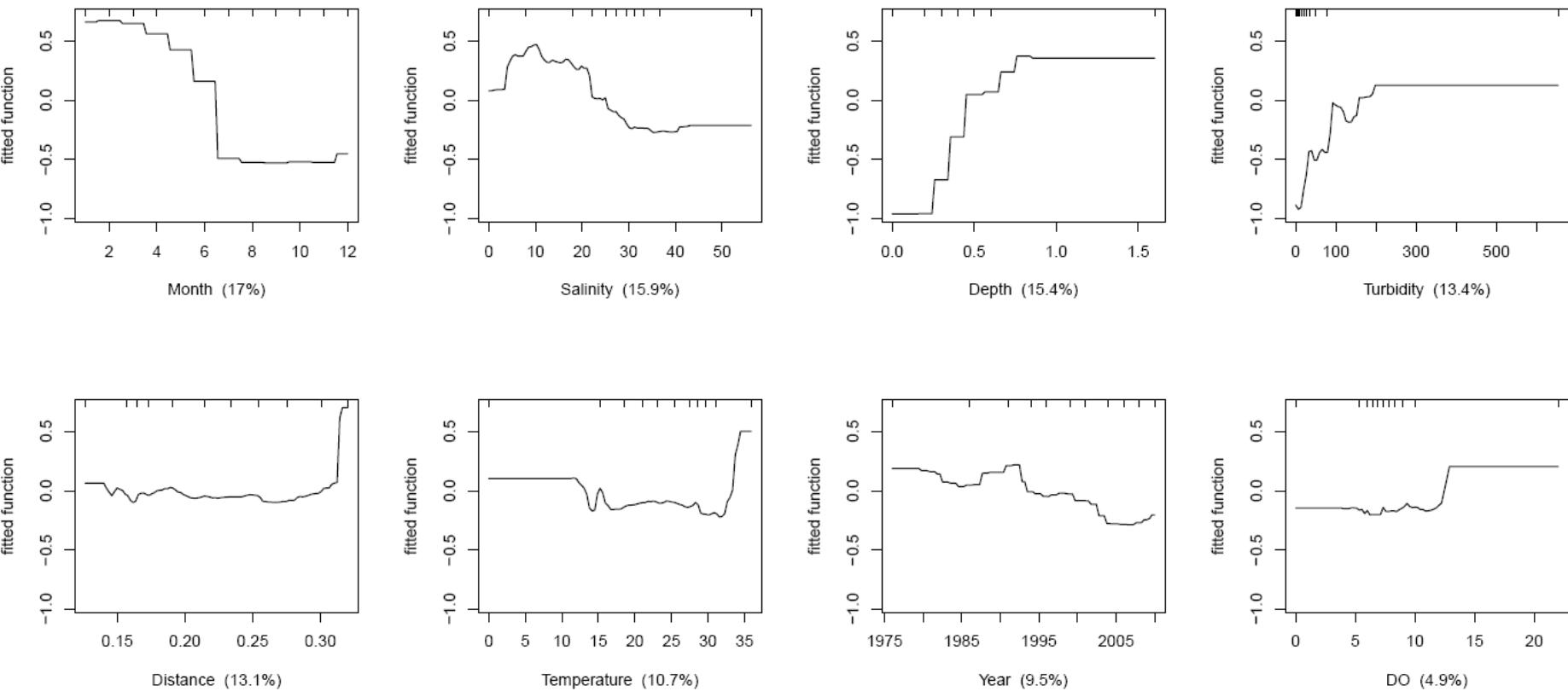
**Callinectes sapidus - page 1**



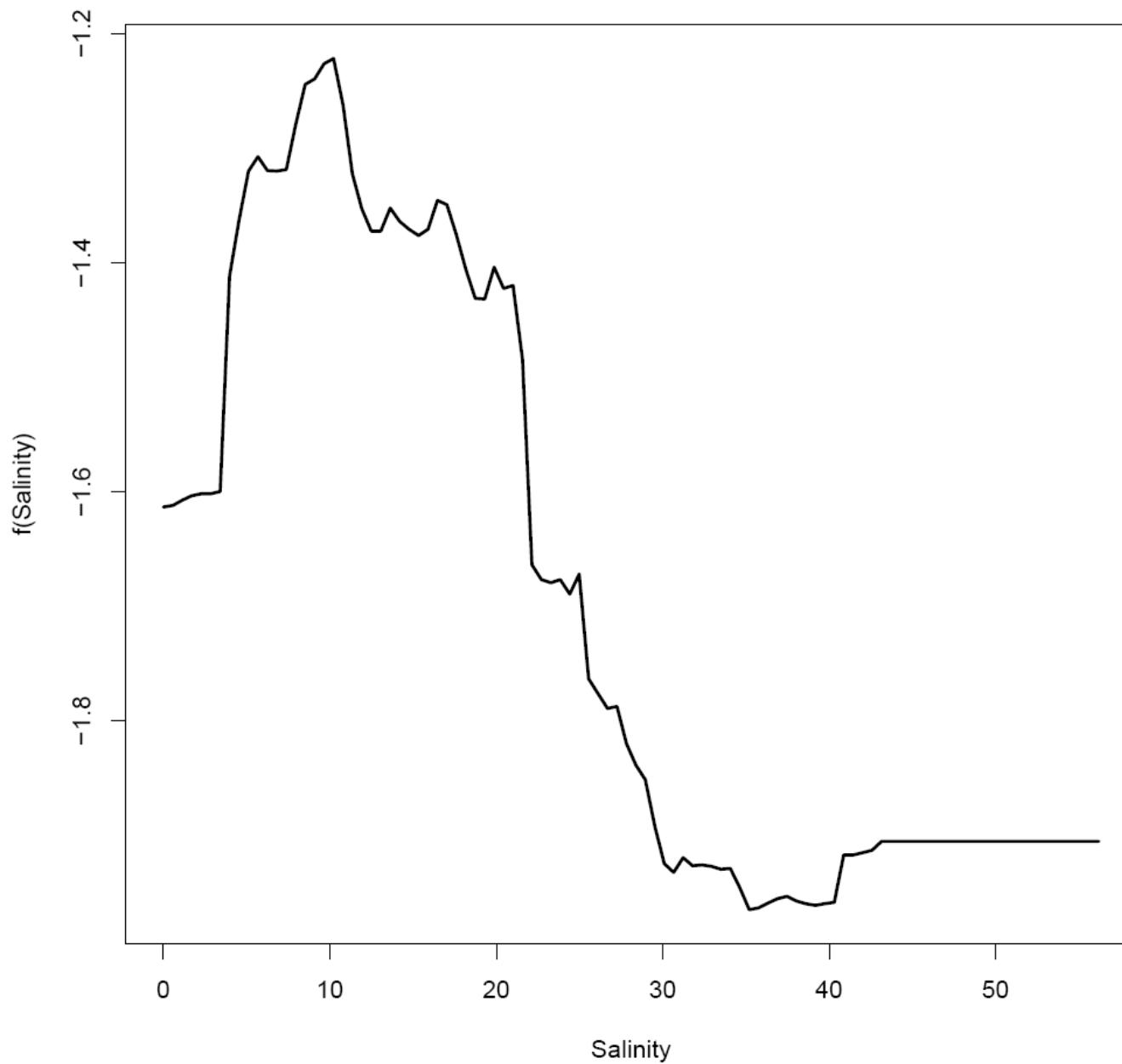
### *Callinectes\_sapidus*



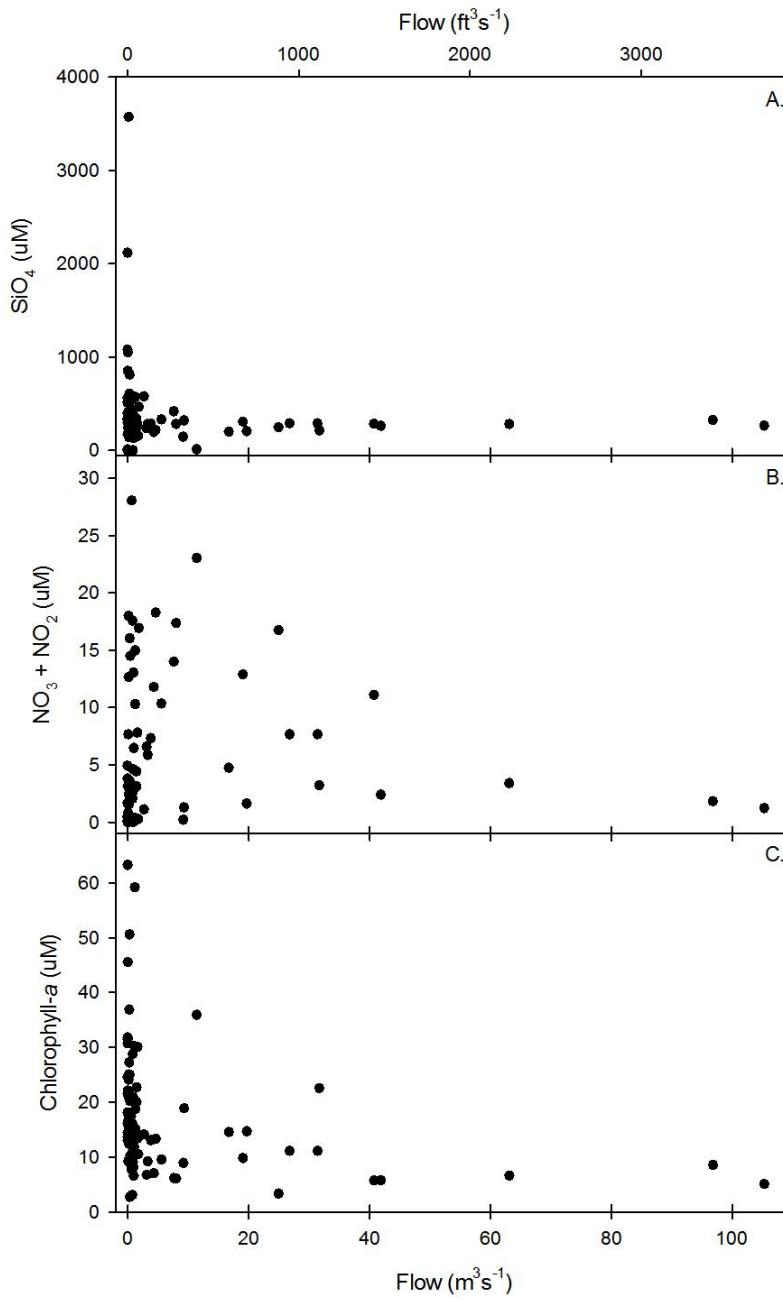
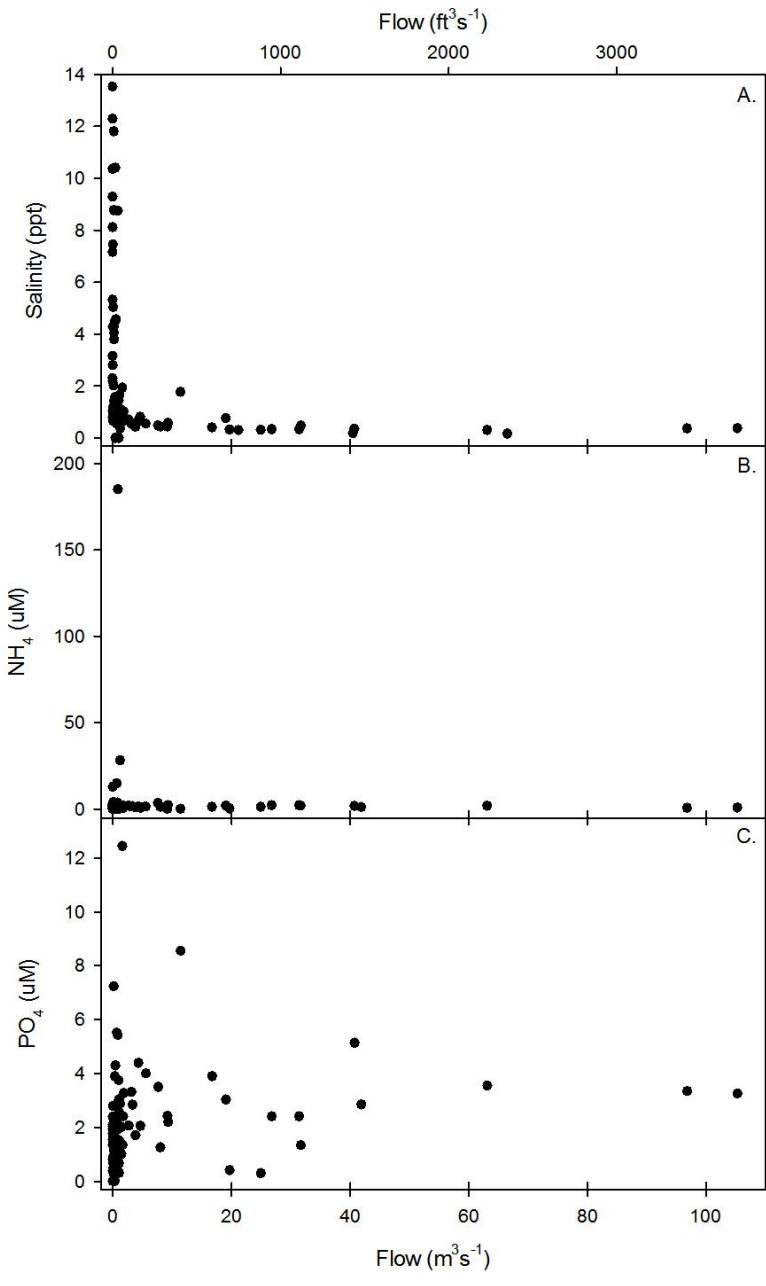
## **Micropogonias\_undulatus - page 1**

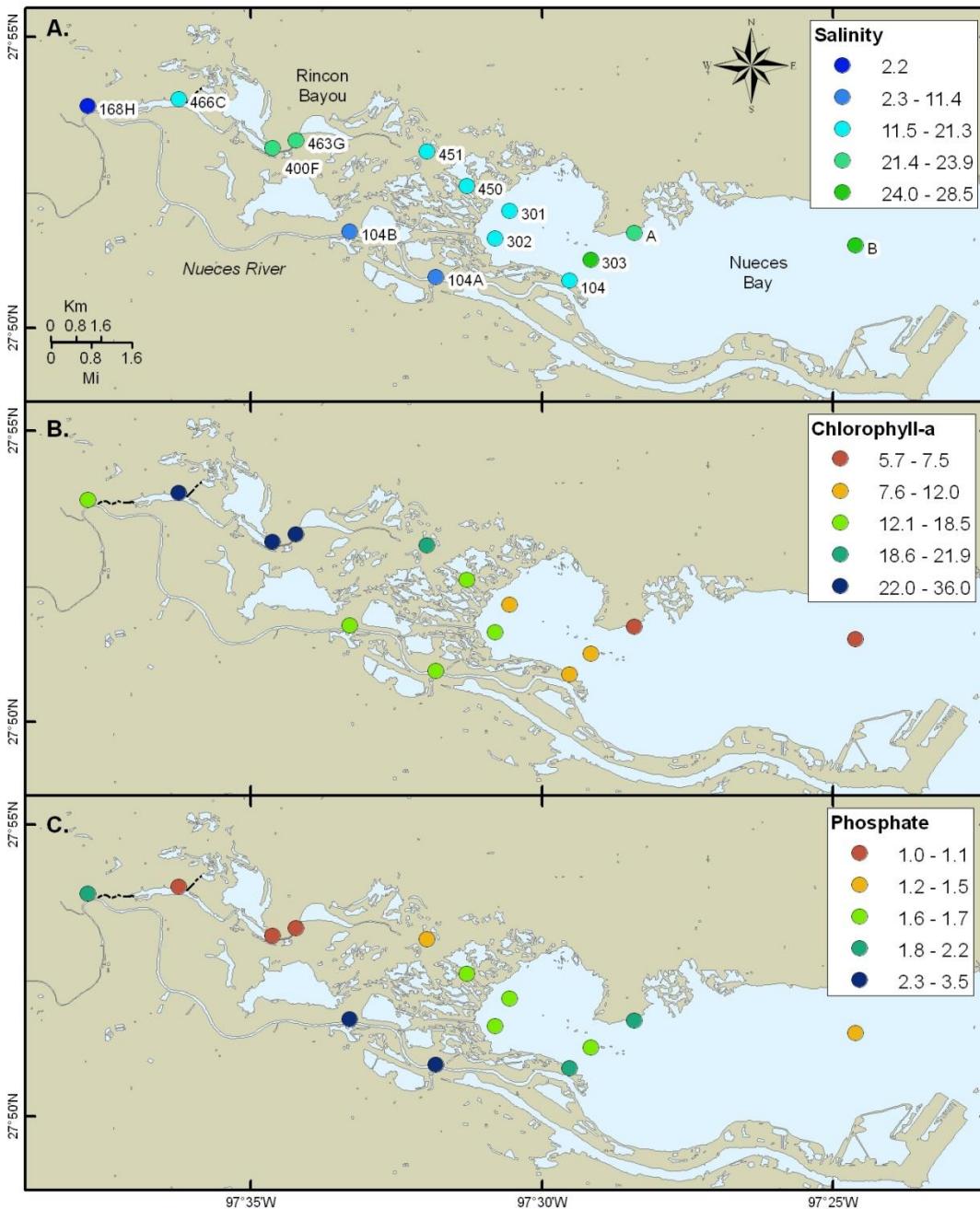


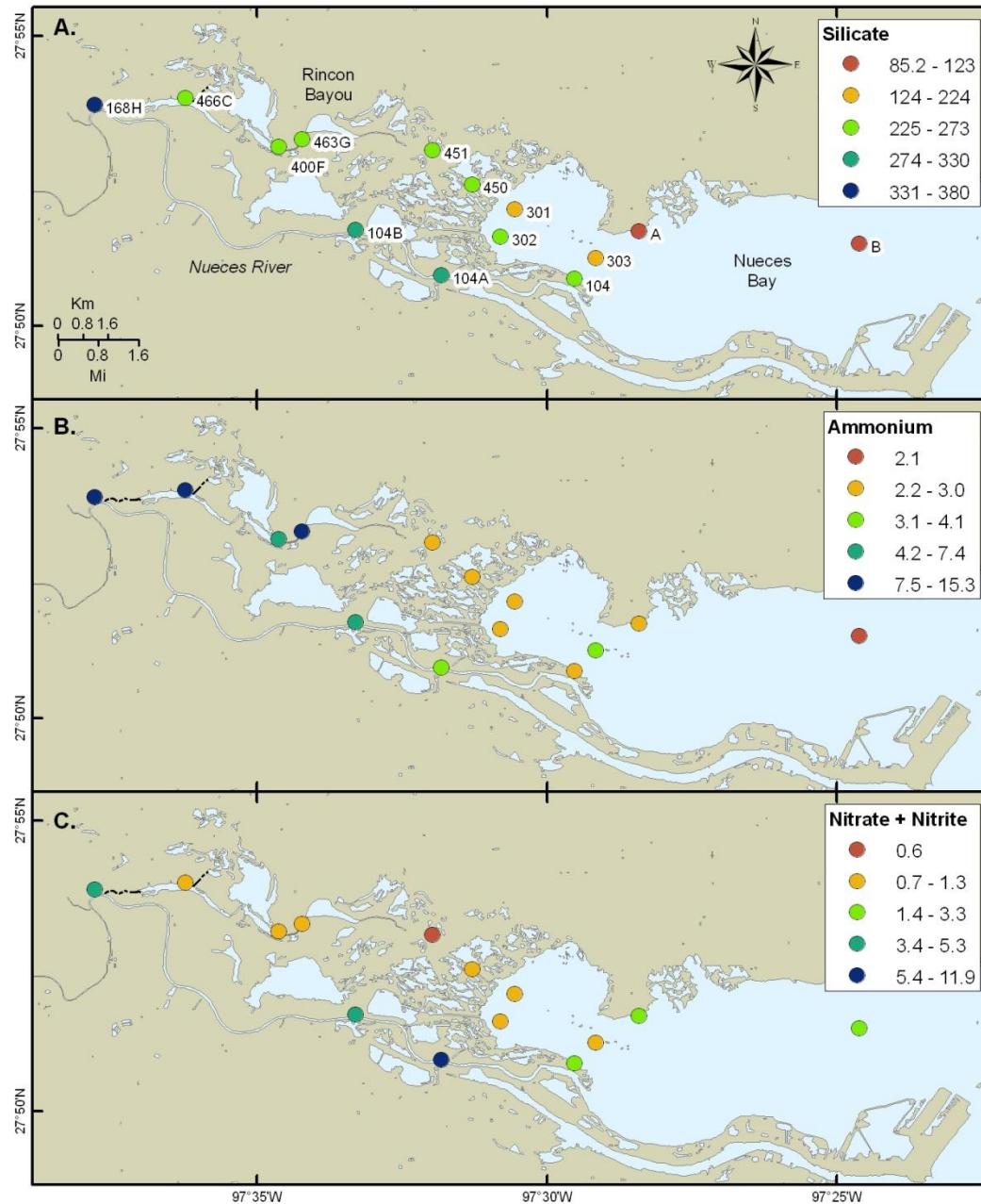
### ***Micropogonias\_undulatus***

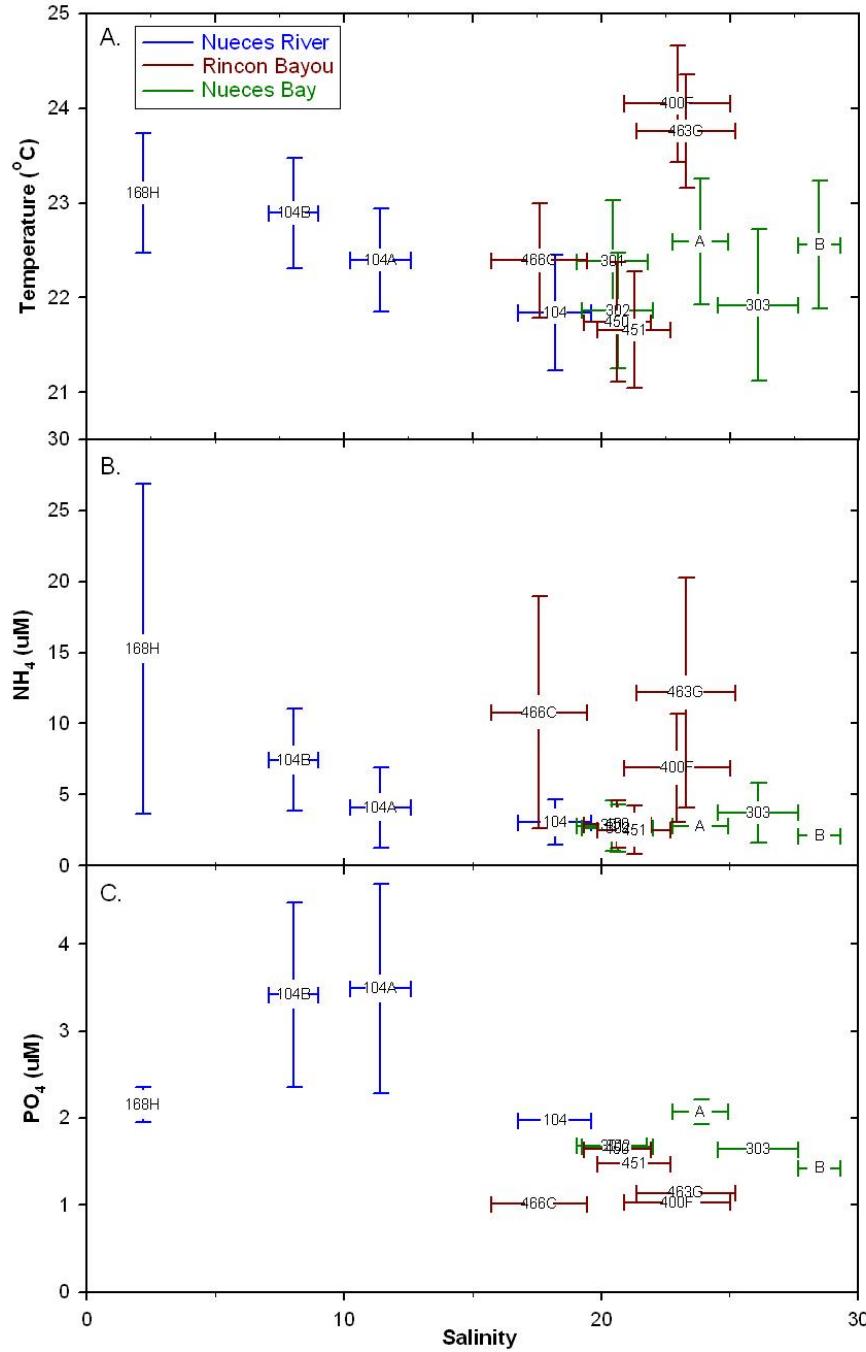


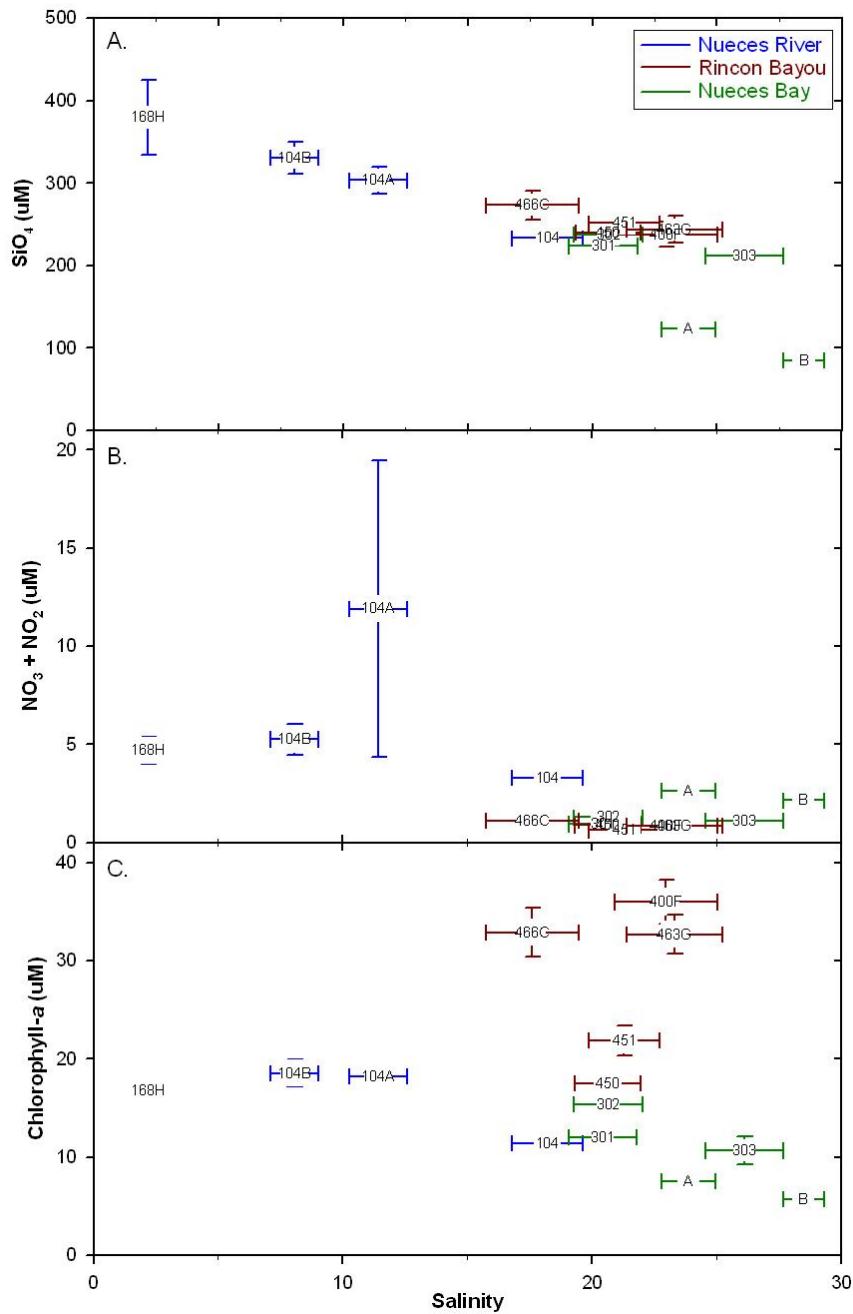
# **Nutrients**











## Flow Regime and Attainment

Condition	Nueces Estuary Freshwater Inflow Regime (Acre-Feet)											
High	# ? Acre-ft #% of yrs			# ? Acre-ft #% of yrs			# ? Acre-ft #% of yrs		# ? Acre-ft #% of yrs			
Base	# ? Acre-ft #% of yrs			# ? Acre-ft #% of yrs			# ? Acre-ft #% of yrs		# ? Acre-ft #% of yrs			
Subsistence	# ? Acre-ft #% of yrs			# ? Acre-ft #% of yrs			# ? Acre-ft #% of yrs		# ? Acre-ft #% of yrs			
	November	December	January	February	March	April	May	June	July	August	September	October
	Winter				Spring				Summer		Fall	

# Target FW Inflow Needs (in Acre Feet) for Nueces Estuary

From: "Freshwater Inflows Into The Nueces Delta",  
J. Tunnell, Aug 2010

MONTH	>70%	>40-<70%	>30-<40%	<30%
January	2,500	2,500	1,200	0
February	2,500	2,500	1,200	0
March	3,500	3,500	1,200	0
April	3,500	3,500	1,200	0
May	25,500	23,500	1,200	0
June	25,500	23,000	1,200	0
July	6,500	4,500	1,200	0
August	6,500	5,000	1,200	0
September	28,500	11,500	1,200	0
October	20,000	9,000	1,200	0
November	9,000	4,000	1,200	0
December	4,500	4,500	1,200	0
<b>TOTAL</b>	<b>138,000</b>	<b>97,000</b>	<b>14,400</b>	<b>0</b>



SELLING OYSTERS.  
CORPUS CHRISTI, TEXAS.

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